THE MONTHLY

Review

AUGUST, 1944 - - - - - - CONTENTS

GLASSTONE—Part X 699
BEAL—Corrosion Resistance of Electrodeposited Lead 719
ABSTRACTS OF CONVENTION PAPERS 725

DEPARTMENTS

Abstract Section 738
Industry News 747
New Products 744
Speakers 1944-1945 750
Branch News 759
Membership Report 770
Book Department 776
Branch Directory 778
Advertisers Index 780

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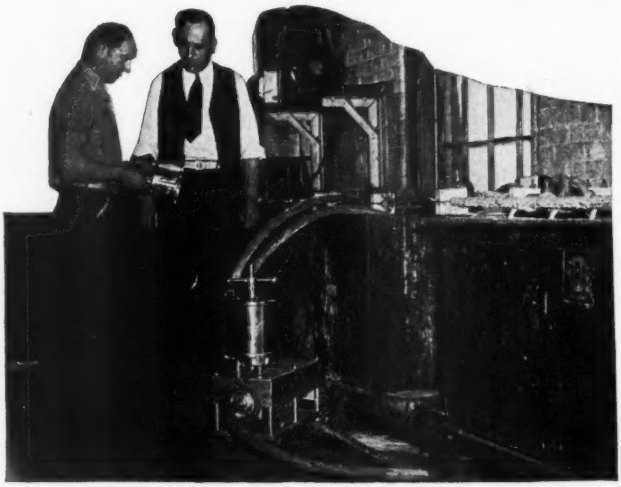

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The Fundamentals of Chemistry for Electroplaters

Part X. Metals and Nonmetals

By SAMUEL GLASSTONE, D.Sc., Ph.D.

PHYSICAL AND CHEMICAL PROPERTIES

AS mentioned in earlier articles, all known forms of matter are built up from ninety-two fundamental chemical units, the elements (see Part I, *Monthly Review*, November 1943). Apart from four of these, which have not yet been identified in nature, all, or nearly all, of the elements have been extracted and obtained in a pure form. It has thus been possible to study these substances and to determine their properties. Such properties, of both elements and compounds, are conveniently divided into two categories, referred to as "physical" and "chemical" properties, respectively. Physical properties are the attributes related to external conditions which do not produce any peranent change in the substance. For example, density, i.e., the weight of unit volume, appearance, e.g., color, brightness or dullness, state, e.g., solid, liquid or gas, and ability to conduct or transmit heat and electricity, are all physical properties which are of importance for various reasons. Chemical properties, on the other hand, refer to interactions which leave permanent changes in the elements (or compounds) under consideration. For instance, iron has the chemical property of interacting with moist air to form the red oxide, familiarly known as "rust." The metal zinc will dissolve in acid with the accompanying liberation of hydrogen gas; carbon will burn oxygen (from the air) to form carbon dioxide; gasoline (hydrocarbons) can be exploded when mixed with air. In these and numerous other cases the observed phenomena or events are associated with permanent changes in the substances involved, and so they are considered under the heading of chemical properties.

PROPERTIES OF COPPER

To illustrate the foregoing statements we will consider the element copper. Its obvious physical properties are that it is a solid with a reddish color and a fairly high density. In addition, it is found to be a good conductor of both heat and electricity. It is malleable, that is to say, it can be hammered into sheets, and also ductile,

that is, it can be drawn into wire form without difficulty. These are the most important physical properties of copper. Among its chemical properties, mention may be made of the fact that it is attacked by certain acids, particularly nitric acid and hot concentrated sulfuric acid. The copper passes into solution in the acid, and one of the products, which can be extracted from the resulting liquid, is a new substance, namely a "salt" of copper. If the acid used is nitric acid, the salt is copper nitrate; from sulfuric acid copper sulfate is obtained. Although copper is not appreciably affected by oxygen from the air at ordinary temperatures, a chemical reaction takes place upon heating. The result is the formation of copper oxide which is readily dissolved by most acids — much more readily than is copper itself — to form the corresponding copper salt. These facts may all be treated as chemical properties of the element copper. Many of these properties will be considered in greater detail in a later article, but for the moment sufficient has been said to indicate the various types of behavior which are included in the respective categories of physical and chemical properties.

METALS AND NONMETALS

Various attempts have been made from time to time to divide the known elements into classes in which the members all have similar physical and chemical properties. The advantage of an exact classification of this type would be that once a given element were identified as belonging to a particular class or group many of its properties would be immediately known. One such classification, which is based primarily on certain physical characteristics, is useful. In this classification the elements are divided roughly into two categories, namely "metals" and "nonmentals." The metals, such as zinc, iron, tin, lead, copper, gold, silver, platinum, etc., are lustrous, shiny solids of relatively high density, usually capable of taking a polish if clean. Mercury is exceptional in being a liquid at ordinary temperatures, but as it has all the other characteristics of a metal it is included in this category. Metals are also excellent conductors of electricity, and so they are used for the transmission of electric power. They are also good conductors of heat, and hence are used for radiators, heating and cooling coils, and so on. Most metals have a high tensile strength, that is to say, they are not easily ruptured, and consequently they are employed in a great variety of constructional work. As mentioned above for copper, most metals are malleable and ductile.

Nonmetals, on the other hand, may be gaseous (e.g., chlorine), liquid (e.g., bromine), or solid (e.g., iodine), to mention three ele-

ments which are closely related to one another in their chemical properties. They are usually dull in appearance, are poor conductors of heat and electricity, and the solids have poor tensile strength and are neither malleable nor ductile. On the whole, therefore, it is a simple matter to distinguish between a metal and a nonmetal. Nevertheless, the various distinctions are not always precise and the classification is not completely exact. As already noted, mercury is undoubtedly a metal but it is ordinarily a liquid. Most metals have a high density, but the metal sodium is so light that it can float on water. The majority of nonmetals are dull in appearance and are poor conductors of electricity; however, iodine crystals are lustrous, and some forms of carbon are able to conduct the electric current to a moderate extent. In spite of these discrepancies, there is little doubt whether a particular element is a metal or nonmetal; there are a few exceptions in this connection which will be referred to later.

ACIDIC AND BASIC OXIDES

Although the distinction between metals and nonmetals is based to a great extent on physical properties, as just explained, there are also certain important chemical properties in which the two groups of elements differ. The majority of, although not all, the elements can be made to combine with oxygen to form the compounds known as "oxides." The typical oxides of *nonmetals* dissolve in water to form "acid" solutions; these solutions are sour to the taste, they affect colored indicators in a particular manner, e.g., blue litmus is turned red, and they attack certain metals, such as zinc and iron. The essential chemical property of the oxides of nonmetals is, therefore, that they are "acidic oxides." Even though they are not able to dissolve in water, as is the case with the oxides of the nonmetals boron and silicon, these oxides nevertheless have the ability to form part of a salt, as do other acidic oxides. It may be mentioned that not all the oxides of nonmetals are acidic, but nearly every nonmetal has at least one oxide having this property.

When the oxides of *metals* are examined it is found that they have the exactly opposite chemical property; they are said to be "basic oxides." Oxides of this type that are soluble in water are referred to as "alkaline;" they feel soapy to the touch, and are able to reverse the color changes in indicators brought about by acids, e.g., red litmus is restored to its original blue color. An alkali and an acid are able to compensate or "neutralize one another, the resulting product being a "salt." Even those basic oxides which cannot dissolve in water are still able to dissolve in acids to form salts; copper oxide, referred

to earlier in this article, is a case in point. Again, not all oxides of metals are basic, but it is probably true to say that every metal has at least one oxide with basic properties. There are certain other differences between metals and nonmetals; for example, the compounds with chlorine, known as the "chlorides," of nonmetals are usually completely decomposed by water, but the chlorides of metals can generally be recovered unchanged from the solution. However, the most important chemical distinction to bear in mind is that the oxides of metals are basic while those of nonmetals are acidic in character.

METALLOIDS

Although they are not very important from the electroplating standpoint, it is of interest to refer briefly to certain elements which have properties which are partly those of metals and partly of nonmetals. These are called "metalloids," the best known being arsenic and antimony. The latter, for example, is like a metal in appearance, but it is brittle and is a poor conductor of heat and electricity. Its oxides are both acidic and basic in nature, sometimes one property predominating and sometimes the other. This intermediate behavior is an illustration of the difficulty encountered in many aspects of science, namely the inability to divide all substances into exact and distinct classes.

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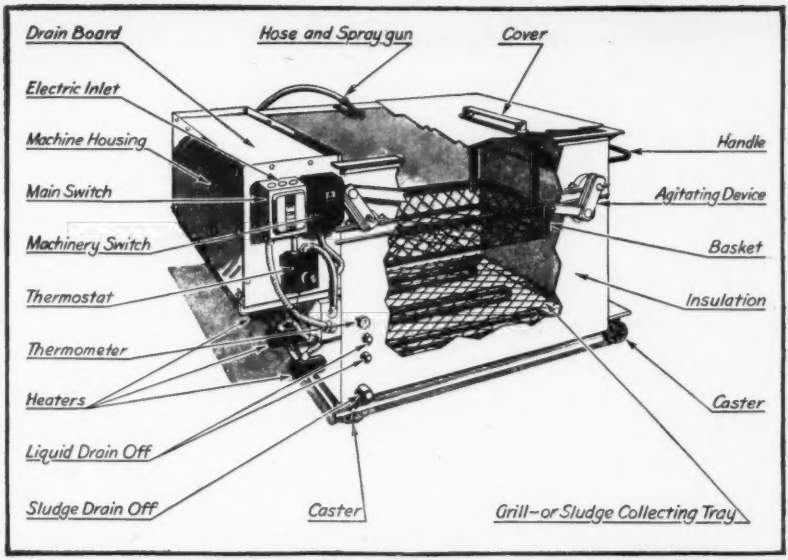

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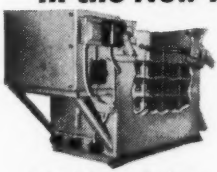

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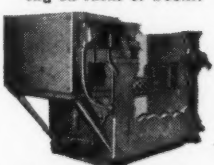

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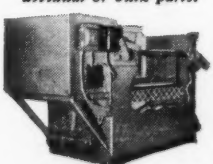

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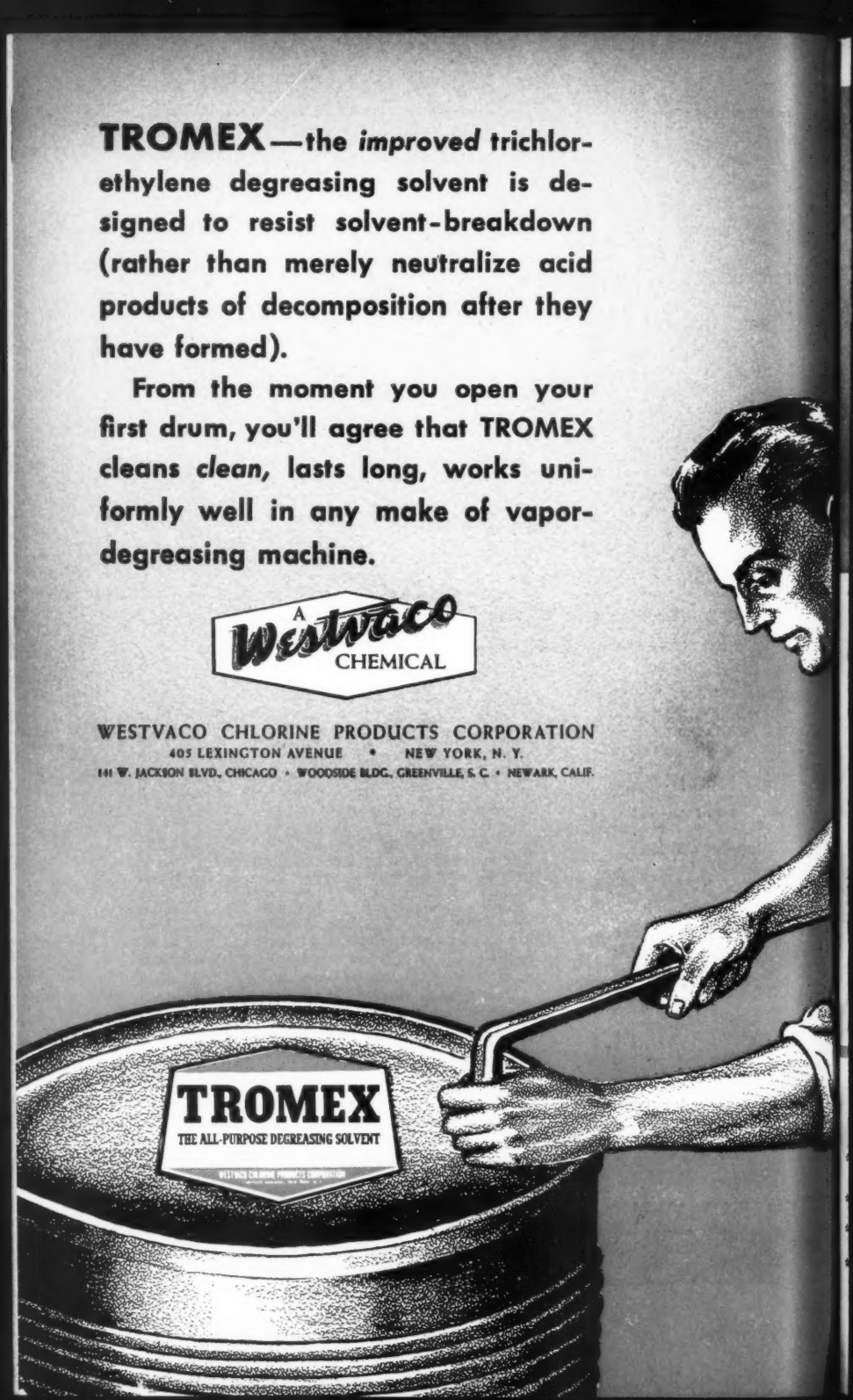

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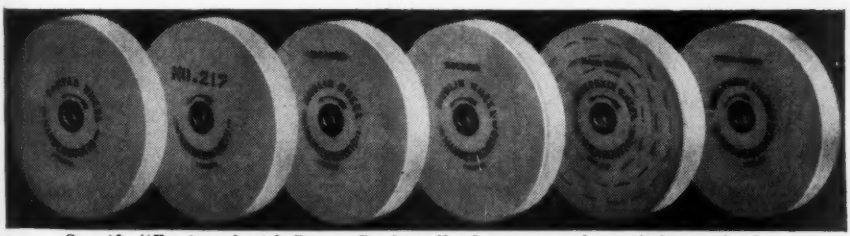

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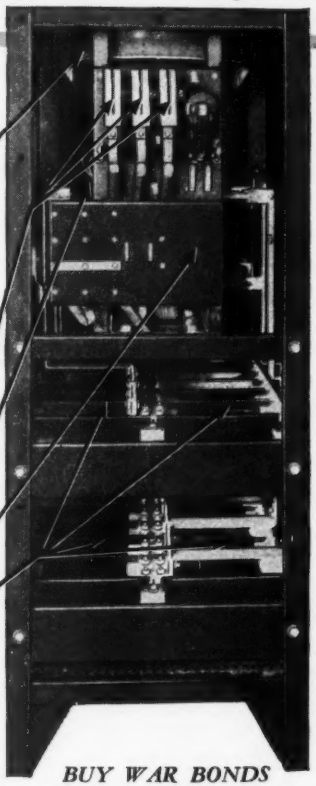

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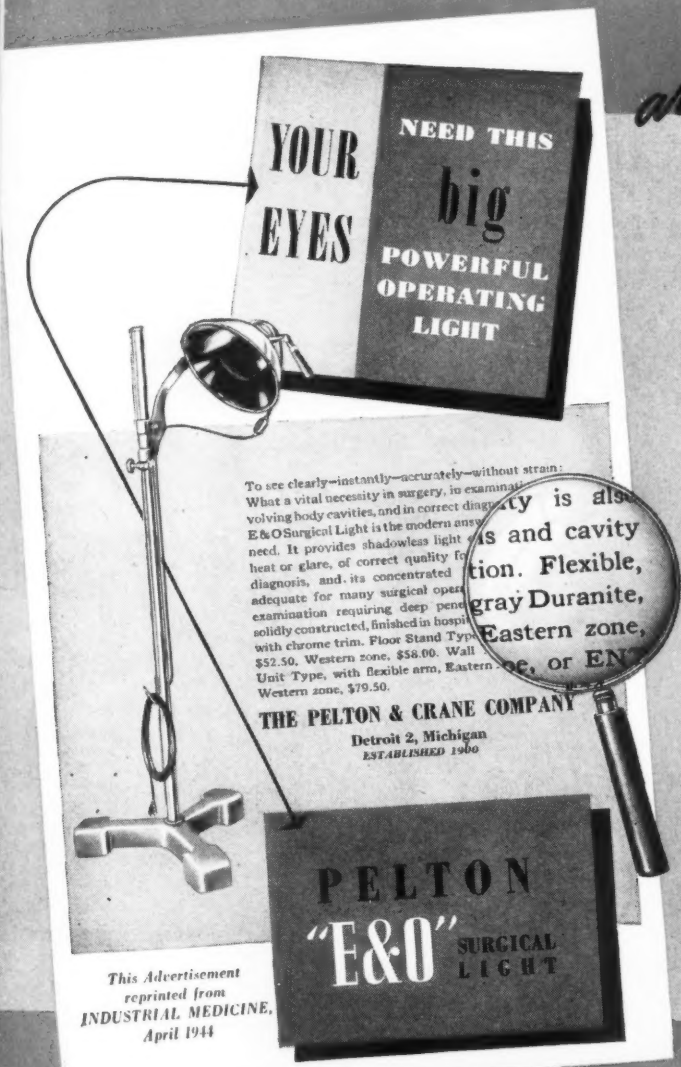

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Corrosion Resistance of Electrodeposited Lead*

By JOHN F. BEALL
The Harshaw Chemical Company

Mr. Chairman, Fellow Members of the American Electroplaters' Society and Guests:

It is a pleasure indeed to have this opportunity to speak to you on the subject of Lead Plating.

You know — it seems that the Electrodeposition of Lead Coatings is somewhat of a War Baby. It shouldn't be, but the fact remains that we hear much of it only in time of war.

The literature indicates that considerable lead plating was done during the first Great War. Some of you here undoubtedly operated such tanks. I think you probably had quite a time getting hydrofluoric acid, boric acid, and lead carbonate together in the proper proportions, filtering and then stabilizing what you had left.

The extremely limited use of lead plating during the years between the first World War and the present conflict was due principally to just two causes: 1) The lack of published data on the desirability of lead coatings and 2) There was no satisfactory solution commercially available.

Although lead is best known for its resistance to Sulfuric Acid it is actually less subject to corrosion than Cadmium and Zinc.[1] There are many applications where Cadmium and Zinc coatings are now being satisfactorily replaced by lead. In some cases the physical properties of lead have provided certain advantages over the former.

Specific cases are reported by the War Production Board[2] where cadmium coatings have been replaced by lead plating very successfully. This has been done on ground contacts including nuts, bolts, and washers for the purpose of equipotentializing combat and other vehicles, and elimination of radio interference. Contrary to Zinc, the lead coatings in such applications do not become covered with insulating corrosion products. Lead is being plated on springs which are protected from mechanical injury. The lead plating does not cause embrittlement of the spring or affect its fatigue resistance like zinc cyanide plating. Lead plating also may replace cadmium where straight corrosion resistance is involved.

*Read at Los Angeles Branch, Nov. 1943.

Lead coatings must be more impermeable than Zinc, i.e., less porous. A most important criterion of a satisfactory solution therefore, is its ability to deposit quickly dense coatings — free from pores and pin holes. The solution must have high efficiency, good throwing power, and be simple in operation and maintenance.

Lead can be deposited from a great variety of solutions including the acidified solutions of acetate, fluoborate, fluosilicate, nitrate, perchlorate, and alkaline plumbates. Dense deposits cannot be produced from all of these baths and in commercial practice only fluoborate, fluosilicate, and perchlorate have been used, the latter more extensively in England.

The other acids tend to form treed and spongy deposits beyond the function of addition agents. In alkaline solutions it is extremely difficult to get sufficient anode corrosion.

A. G. Betts[3] was first to apply fluoborate and fluosilicate solutions commercially and used glue as addition agent. He reported on these solutions in 1901. You will be interested in the method of preparation of these solutions and a comparison of operation.

Fluosilicate Solution

Hydrofluoric Acid is reacted with silica to form hydrofluosilic acid. Basic lead carbonate (comm. white lead) is dissolved in hydrofluosilic acid to form lead fluosilicate. Best results are obtained with this solution if low current densities are employed whereby a thin coat is deposited but it is dense and smooth. High current densities produce coarse treed deposits. Glue is used as addition agent and functions as in other solutions.

Fluoborate Solution

Considerable development work has shown that electrodeposition of lead can be most successfully accomplished when plated from a lead fluoborate solution. In general this bath is prepared by reaction of hydrofluoric acid and boric acid to form a compound of somewhat complex nature but usually called fluoboric acid and represented by the formula HBF_4. When basic lead carbonate is dissolved in this material there is formed, as near as can be determined, lead fluoborate having the formula $Pb(BF_4)_2$. This material is usually filtered and stabilized by excess of fluoboric acid and boric acid — i.e. more of the latter than is required to react with the hydrofluoric acid. Excess acid increases the conductivity and produces finer deposits.

Lead fluoborate solution is much preferred to fluosilicate solutions for the following reasons:

1. Steel can be plated directly whereas with the fluosilicate bath

a preliminary coating of copper is necessary.

2. Fluoborate solutions are more stable — decompose less rapidly during use.

3. Deposits from fluoborate solution are finer than from fluosilicate.

In the development of Fluoborate Lead Solution Concentrate we were concerned with solution variations, effect on the same of addition agents, etc. Many solutions and combinations were tested and were of value only to the extent to which they contributed to the establishment of the present formula. Thus was perfected a solution concentrate which, for satisfactory electrodeposition of lead, requires only dilution with water to recommended levels and addition of a small quantity of bone glue.

The solution as available is 66° Baume equivalent to 67 oz. of lead per gal. Operating ranges are from 13-32 oz. of lead per gal. For the same thickness of deposit it plates three times faster than nickel, has excellent throwing power, and the bath operates with 100% cathode efficiency. Over one hundred installations are now in operation, practically all in war work, doing everything from bolts and nuts in barrels to large pieces in huge tanks.

Salt spray data continues to be a valuable criterion in estimating the corrosion resistance of electrodeposited coatings. Salt spray figures have been too easily misinterpreted because of variations in base metal now available and difference in spray technique. Comparisons, therefore, with other salt spray results and figures on other metals and outdoor exposure tests must be considered carefully. Average figures obtained in our laboratory are as follows: .0001 of lead will give 18-30 hours salt spray resistance; .00025 a minimum of 24 hours; .0005 a minimum of 50 hours; .001 a minimum of 100 hours; .001 has also given us over 200 hours without the slightest indication of any breakdown while .0005 which broke down at 100 hours was no worse at the end of 200 hours.

I am very pleased to be able to present to you experimental data on corrosion resistance of lead plated steel which was given before the annual meeting of the A.S.T.M.[2]

The most complete outdoor tests were made by Clarke[4] in the industrial atmosphere of Woolwich, England. Lead was deposited on panels of sheet steel. .0001 was rusted all over in 6 months; .00025 — one third of surface rusted in 6 months — rusted nearly all over in 1 year — flaky rust all over in 3 years; .0005 had a few very small rust spots in 6 months — small rust patches in 1 year — rust all over, smooth, adherent in 3 years; .001 showed very few small spots

in 6 months — no worse at end of one year and at the end of 3 years there was no apparent rust and coating was in good condition. While porosity apparently existed in the .001" thick coating, the pores closed up or became filled by corrosion product and were ineffective on continued exposure.

Some evidence of the effect of porosity of lead coatings may be obtained from analysis of galvanic couple tests of the A.S.T.M. Committee B-3.[5] In these tests washers of different metals were bolted together in such a way that the only metallic contact was between the washers being tested. The only surfaces exposed to the atmosphere were those of the edges of the washers. Areas chosen for tests included La Jolla, California — foggy sea coast; Key West, Florida — sea coast; Pittsburgh, Pennsylvania — industrial; New York City — industrial near sea coast; Phoenix, Arizona — desert.

It may be concluded from these tests that 1) Lead provides greater protection of underlying iron electrochemically through pores in the coating in uncontaminated or seacoast atmospheres than in industrial atmospheres. 2) The presence of chlorides in industrial atmospheres increases the protective ability of lead. 3) In a strictly industrial atmosphere lead does not offer much electrochemical protection and in some cases may actually accelerate corrosion of steel.

These tests showed that lead is more anodic to iron than either nickel or copper and therefore provides greater protection. It compares favorably with zinc in sea coast areas but is inferior in industrial, rural, and desert areas.

Further tests were conducted by Committee B-3[5] to determine the performance of lead-coated steel in presence of other metals. Localities selected were the same as above and provided a good cross-section of outdoor atmospheres.

These data indicate that lead-plated steel should not come in contact with aluminum. In general it should also be kept away from contact with zinc and zinc-plated parts, although a small lead-plated part probably would not affect a large zinc-plated part.

These tests show that lead does not cause acceleration of the corrosion of copper, iron, nickel or tin. In fact the metals are protected in sea coast atmospheres, industrial sea coast, rural and desert atmospheres. In strictly industrial atmospheres the lead may act either way but in no case was the corrosion of the lead or the other metals very pronounced. It may be concluded therefore that lead-coated parts could be safely used with these metals.

Electro-deposition of lead is rapidly gaining the importance it deserves. Before the outbreak of the present war uses were limited to

parts subject to chemical corrosion. Now a wide variety of critical needs have been fulfilled. Parts now being lead-plated include storage battery fittings, gas heater flues, refrigeration brine tanks, coil springs, gas mask parts, packing rings, gaskets, bolts, nuts, screws and washers, aircraft engine bearings, roofing sheet, etc. Dense deposits obtained from the Lead Fluoborate bath have made possible many new applications.

In considering the subject of porosity it is well to consider that defects in the plate are often a continuity of similar defects in the base metal. In bright nickel plating, for example we found that a deposit could be produced which was free from all pits and pinholes (by X-ray examination) but only when deposited over a perfect cathode. In a solution operating at 100% cathode current efficiency it is thought that no pits or pinholes should exist other than over such defects as are present in the base metal.

Much comment has been made and some work has been done on the matter of copper under lead deposits — possibly to improve salt spray resistance. In our work on this problem we found that a half thousandths of lead plate is just as good as a half thousandths total of copper and lead. If there is any difference it must be laid to cleaning or other preplating operations supplemented by the alkalinity of the copper bath — rather than the copper deposit itself.

When a lead-coated part is to be soldered then a copper flash under the lead is helpful. Lead does not wet steel and does wet copper somewhat. A copper undercoat prevents crawling of lead when the soldering iron is applied. Tin underneath would be even better. It has been found[6] that while a lead-coated sheet can be spot welded to plain steel, it cannot be spot welded to another lead-coated sheet.

Preparation of parts for plating consists of electrolytic cleaning followed by a short pickle in 5%-8% Sulphuric Acid. Where coating will be subjected to elevated temperatures steel shot blasting is preferred to pickling.

The use of lead-coatings has of course, been accelerated by the need to replace critical metals, but platers and engineers are becoming familiar with its properties and many permanent uses are developing. It is widely felt that lead plating will achieve an important position among metal finishes when peace time is again restored.

1. Blum & Hogaboom, Principles of Electroplating and Electroforming.
2. Gustaf Soderberg, Consultant Metals Branch, WPB.
3. Trans. Am. Chem. Soc. Vol. 80 (1941).
4. Jl. Electrodepositors Tech. Soc. p. 141 (1939).
5. C. E. Huessner, Chrysler Eng. Laboratories.

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Abstracts of Convention Papers

STRESS IN ELECTRODEPOSITION OF NICKEL

By BERNARD MARTIN

This paper is a review of the various information available on stress in electrodeposited nickel and some of the effects of the phenomenon. Stresses in nickel deposit have been estimated as high as 36,000 p.s.i. Stress of the magnitude will cause one of several effects. It will bend or warp the base metal if it is thin and the deposit is relatively heavy; the deposit may crack exposing the base metal or the deposit may peel if the adhesion is poor or its internal stresses exceed the adhesive forces.

In most cases the stresses of an electrodeposit are ignored by the plater but there are several places were they are important and should be controlled.

In plating for anti corrosion purposes, cracking or loosening of the deposit will expose the base metal and permit or accelerate corrosion. In electroplating non conductors or aluminum where adhesion is poor at best the deposit may lift off causing rejects. Where the part to be plated is thin there may be enough warpage to change the dimension or cause shorting of the plating cell.

Among the factors which reduce the deposition of the "hydrate" (the most commonly accepted cause being stressed deposit) are 1. electroplate at a lower Ph, 2. increase the plating temperature, 3. use buffers which maintain a Ph of the cathode film below the critical point, 4. plate with low cathode current density.

INDIUM PLATING

By W. S. MURRAY

There are four plating baths for indium coating known today — cyanide, sulphate, fluoborate and sulphonate. Of these the cyanide bath is used commercially although it has the disadvantage of using insoluable anodes necessitating the use of salts to maintain solution com-

position and thus it is somewhat difficult to maintain by analysis. A new bath received introduced is the sulphonate. Although the bath has received no extensive commercial usage this bath seems to have the advantages; good throwing power, low metal concentration permitting low inventory of metal in process, clear solution, uses indium anodes making it relatively easy to maintain, and a good cathode efficiency.

Most indium deposits are applied to another plate and diffused into it to make use of its properties. It is usually diffused into lead, silver, copper and gold. The diffusing can be done just above the melting point of the indium approximately 350°F.

DYED ANODIC COATINGS ON ALUMINUM PRODUCED BY THE CHROMIC ACID PROCESS

By L. G. TUBBS

Coloring of aluminum follows the regular anodizing procedure with a supplemental dying operation. The anodizing must be done without handling and in such a way as to produce uniform oxide coatings in order to produce uniform colors. Handling procedures are given for the various commercial alloys which may be dyed. The dying must be carried out carefully — among the factors which must be controlled are the concentration of the dye solution, Ph, temperature and time of immersion. A list of satisfactory dyes is given.

ELECTRO-FORMING

By FRANK SAVAGE

Although electro-forming is an old art it has never received much publicity or as much commercial exploitation as it deserves. The band instrument industry is one of high class work with relatively small production requiring very severe working of metals by conventional methods. This combination of conditions makes it ideal to adopt electro-forming. Although the author has used copper, nickel, brass and cobalt-nickel in electro-forming his discussion is limited to copper. Among the factors important are, solution composition and uniformity, agitation, temperature control, and control of pitting. The plating solution is

32 oz./gal. copper sulphate
10 oz./gal. sulphuric acid
1 pt./100 gal. molasses

Phenol sulphuric acid and other common addition agents were tried but they were removed so rapidly by the filter medium and activiated carbon that the plating characteristic of the solution changed. Molasses is removed much as other addition agents but its concentration is not critical and thus the plating characteristics do not change.

Most band instruments permit permanent molds to be used which can be coated with a parting medium. The one used by the author is as follows:

Air Spun Graphite	3 to 4 lbs.
Beeswax	1 lb.
Resin	¼ lb.
C C14	1 gal.

Trichlorethylene has been substituted for the carbon tetrichloride and it assists in the dispersion of the graphite.

All plating is done with insoluble anodes and the solutions are maintained in external cells. The cells are divided by micro porous rubber diaphragm with the cathode outside of the rubber. The copper concentration is built up in the anolyte. What small amount of copper defuses through the diaphragm deposits as a spongy mass which is removed mechanically.

This paper is an exposition of the application of electroforming to precision manufacturing where its application is justified from a quality standpoint as well as from cost considerations.

ANODIZING OF ALUMINUM

By ALBERT R. GOODKIN

This paper accumulates the existing information on the anodizing of aluminum with subsequent treatments. The various advantages of the chromate, sulphuric acid and acid methods are discussed. The treatment of sealing, waxing and dying are discussed with many details of dye characteristics.

ALLOY PLATING

By M. DIGGIN and G. JERNSTEDT

This paper gives the data on a new ternary alloy plate of Copper, Tin and Zinc. The deposit having a nominal composition of Cu 56%,

Sn 28%, Zn 16% is bright, having a reflectivity of 80-85% hard — it being harder than a normal nickel deposit — possesses good wear resistance, ductile — it being possible to bend a plated sample with less danger from peeling than with nickel deposits. It can be soldered, it has good tarnish resistance, and good throwing power. The deposit is plated from a complex cyanide solution which can be maintained by frequent analysis. The paper describes this as a patented solution developed by Western Electric and Manufacturing Co. which has been in production long enough so that most of the production problems have been solved.

ANOZINC AND OTHER NEW COATINGS ON ZINC

By DR. J. E. STAREK

Anozinc is an electrochemical treatment of zinc plated metal and alloy zinc parts to produce a corrosion resisting coating much the same as the anodized coating on aluminum. The process is a proprietory one and the exact composition of the salts is not revealed. However bath compositions of the undisclosed salts, operating conditions and maintainance are discussed. The coating is of the chromate type and can be produced in either black or yellow. Three to ten minutes anodizing at 10-20 a.s.f. are sufficient to treat the coatings. The process is not readily adaptable to barrel plating since the coatings have a relatively high electrical resistance. Tests data indicates the value of these coatings.

Appearance of White corrosion product

Zinc	1- 2 hours
Black Anozinc (unsealed)	75-125 hours
Black Anozinc (sealed)	100-150 hours
Yellow Anozinc	150-200 hours

Failure of sample by appearance of rust

Zinc	2 hours
Black Anozinc (unsealed)	650
Black Anozinc (sealed)	1000
Yellow Anozinc	650

There is considerable discussion of the mechanism of the formation of the coating and mechanism of its protection of the base metal.

A black dip coating for use on zinc is mentioned and some data is given on its preparation.

POROUS CHROME

By RUSSELL PYLE

This paper gives details on the mechanical aspects of porous chromium plating on the lubrication of internal combustion engine cylinders. The worst condition is at the top of the stroke at the instant of firing. At this time the velocity of the piston is low or zero aiding the breakdown of the film of oil. At the same time the ignition of the charge increases the pressure between the piston ring and the cylinder further aiding the film breakdown. Along with these facts is the corrosion by sulphuric acid from the feul. Porous chromium deposits increases the wetability of the surface for oil. This retains the oil film reducing wear and corrosion. The newer channel type of porosity has proven useful for high speed engines.

HARD CHROME PROBLEMS

By ARTHUR LOGOZZO

This paper deals with some of the practical problems confronting the hard chrome plater. He deals with the problems of stress relieving of parts before and after plating and some of the things that occur when this detail is ignored. The problem of plating chromium over chromium is considered in some detail. The recommended procedure is: 1. Anodic alkali etch, 2. Water rinse, 3. Anodic Chrome etch — until gasing uniformally, 4. Immerse in plating tank — 5-10 minutes, no current, 5. Plate 5 minutes 2.5-3.0 volts, 6. Plate at standard voltage and current. Among other factors discussed are stripping of deposit and control of solutions.

DYESTUFFS

By F. P. SUMMERS

The dying of anodic films on aluminum has been a small industry not exciting much interest from the organic dye companies. The field has grown enough so that work has been done and direction for successful dye of these films is being published. This paper is one of the best giving details of operation.

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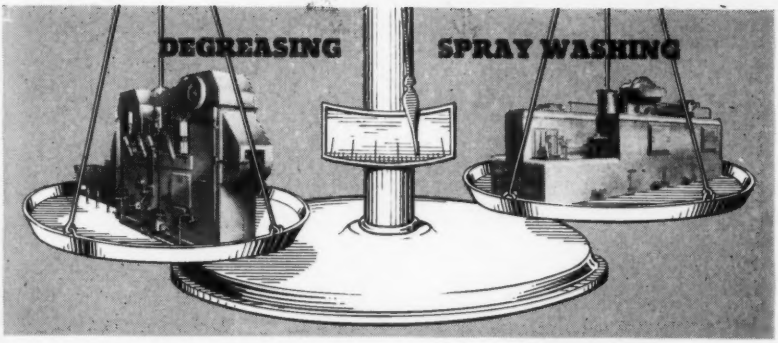

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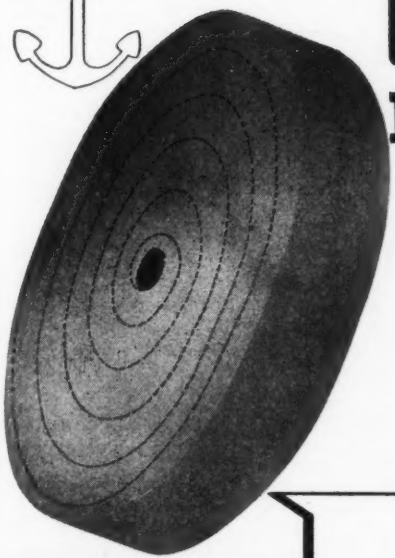

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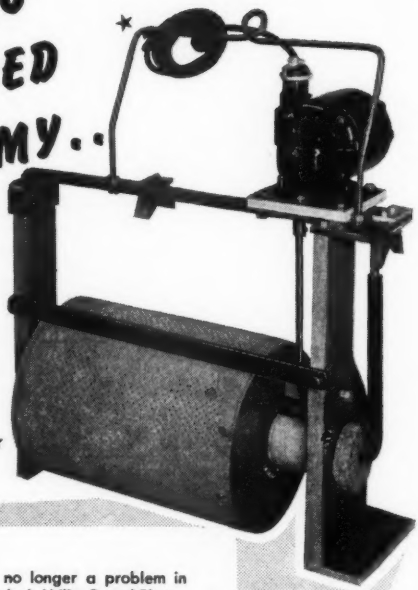

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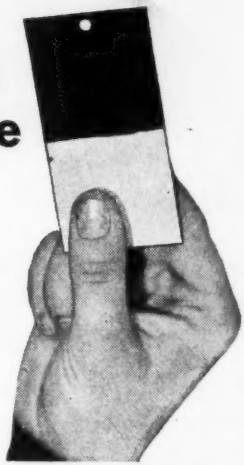
If one of your jobs is to protect zinc or cadmium surfaces from corrosion, and do it without slowing up your production lines, you will be interested in the Iridite process. Iridite meets all Government specifications as a corrosion-resistant treatment for zinc. Iridite can be hot-water rinsed. The uniform color obtained with Iridite makes inspection easy and reduces rejects.

Simply dip the plated parts or assemblies in Iridite solution for as few as 15 seconds, then rinse in water. The use of hot-water rinse reduces the whole drying process to a few seconds. Parts can be handled freely as soon as dry.



TEST IRIDITE FOR YOURSELF! Write on your company letterhead for this sample panel of Iridited zinc-plating. Put the entire strip to any corrosion test you choose, then compare the two halves. You will see for yourself why Iridite is approved under so many military and industrial specifications.

Iridite solution is used at ordinary shop temperature. No special personnel or equipment is needed. By modifying the strength of the solution, the process can be adjusted to any machine cycles.

Iridite can serve as a corrosion-resistant final finish. In addition, Iridite has been tested by many large paint manufacturers and has been proved a highly efficient paint base. Iridite is furnished in either jet black or standard Army olive drab. The process can easily be added to the end of your plating lines. We invite you to write for a sample for testing, together with further information. Address: Rheem Research Products, Inc., 708 Chemical Building, 2523 Pennsylvania Ave., Baltimore 17, Maryland.

RHEEM RESEARCH PRODUCTS, INC.

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New England Distributor: MacDermid, Inc., Waterbury 88, Conn.

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The H-VW-M Copper-Oxide Plate Type Rectifier for Electroplating or Anodizing offers these distinctive features

- dependability
- simplicity
- compactness
- long life
- moderate first cost
- freedom from moving parts
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H-VW-M Rectifier Power Cubicle

- low maintenance
- efficient low voltage operation

Operator's control cabinet

H-VW-M Rectifiers operate efficiently both at full load and at lower loads and voltages, and without the presence of liquids, chemicals or motion. They handle outputs from 300 to 2000 amperes at 6 volts, and from 150 to 1000 amperes at 12 volts.

Hanson-Van Winkle-Munning Copper Oxide Plate Type Rectifiers can be used advantageously in full automatic and other multiple tank installations in conjunction with generators.

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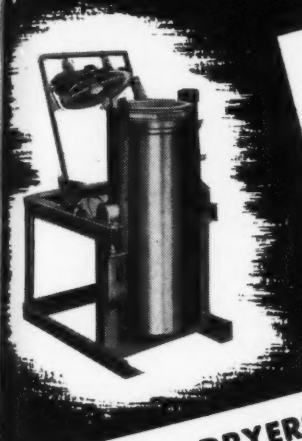

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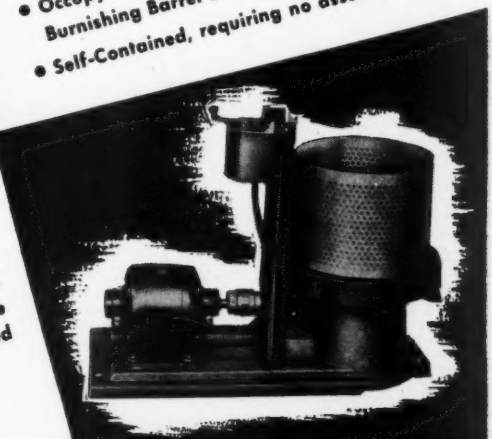

Hanson-Van Winkle-Munning service includes coordinated recommendations for the use of the company's products. Feel free to call on H-VW-M engineers for advice on any problem in the electroplating and polishing field.

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THE ABSTRACT SECTION

WALTER PINNER

Chairman Program and Educational Committee

Electro-Organic Chemistry in the Patent Office. By JOSEPH ROSSMAN. Electrochemical Society—Preprint 84-11 for meeting Oct. 13-16, 1943, p. 88-99.

United States patents are listed relating to synthesis of organic compounds by means of electrolytic action. The list is based on the revised classification of the United States Patent Office of official class 204, Chemistry, Electrical and Wave Energy, sub-classes 62, 72 to 81, inclusive. A list of published patent applications seized by the Alien Property Custodian is appended.

V. MATTACOTTI, FRANK K. SAVAGE

Corrosion of Lead-Indium Diffusion Alloys. By J. M. FREUND, H. B. LINFORD, and P. W. SCHUTZ. Electrochemical Society—Preprint 84-7 for meeting Oct. 13-16, 1943, p. 62-65.

Tests to study the chemical corrosion of lead and lead indium diffusion alloys by lubricating oil at 170° to 180° C. showed that no protective film is formed in the corrosion of lead. It was found that indium inhibits the attack on lead, that completeness of immersion is important, and that lead sulfide is one of the products of corrosion.

V. MATTACOTTI, FRANK K. SAVAGE

Electronic Methods of Automatic Control of Industrial Processes. By E. H. ALEXANDER. Electrochemical Society—Preprint 83-28 for meeting April 8-10, 1943, p. 319.

With the aid of highly instructive and elucidating slides the author reviewed and discussed the application of electronic devices:

1. For the automatic control of storage battery charging;
2. For the detection and control of radiant energy;
3. For the accurate timing of industrial processes;
4. For the control of heat in resistance welding;
5. For temperature control and regulation in resistive heating as well as in inductive heating;
6. For the control of rectified current, supplied by ignitrons.

V. MATTACOTTI, FRANK K. SAVAGE

The Electrolytic Reduction of Amides. By SHERLOCK SWANN, JR. Electrochemical Society—Preprint 84-8 for meeting Oct. 13-16, 1943, p. 67-73.

Electrolytic reductions of N,N-dimethylvaleramide to N,N-dimethylamylamine and of acetanilide to ethylaniline in sulfuric acid solutions were studied at cathodes of cadmium, tin, lead, mercury, zinc, aluminum, bismuth, copper, nickel, iron, and cobalt; best yields of N,N-dimethylamylamine were obtained at a lead cathode. Cadmium and zinc showed some activity. The best yield of ethylaniline was, again, obtained at a lead cathode. The only other active cathode was cadmium. The influence of the physical condition of the surface of the cathode is discussed.

V. MATTACOTTI, FRANK K. SAVAGE

Protection Against Caustic Embrittlement by Coordinated Phosphate-pH Control. By T. E. PURCELL and S. F. WHIRL. Electrochemical Society—Preprint 83-25 for meeting April 8-10, 1943, p. 279-295.

This paper presents the results of tests with embrittlement detectors on boilers in actual operation under varying condition of water treatment, pressure, time, and specimen composition. A new method of water treatment for protection against

caustic embrittlement is offered; it is particularly applicable to high pressure boilers.

V. MATTACOTTI, FRANK K. SAVAGE

New Phosphate Coatings with Unusual Corrosion Resistance. By GEORGE JERNSTEDT. Electrochemical Society—Preprint 83-30 for meeting April 8-10, 1943, p. 324-335.

Phosphoric acid solution treatments of steel and zinc surfaces have been used for centuries to increase paint adhesion and thereby improve corrosion resistance. The phenomena of the "wiping effect" are described. The requirements of a good phosphating process are presented, and the need of a satisfactory "predip" solution indicated. The investigation of a predip solution is outlined with a predip containing 1 to 2% disodium phosphate, activated with a titanium compound, is described. Phosphate coatings employing this predip are shown to have greatly improved resistance and to have many applications where no supplementary organic coating is required.

V. MATTACOTTI, FRANK K. SAVAGE

Distribution of Galvanic Corrosion. By H. R. COPSON. Electrochemical Society—Preprint 84-17 for meeting Oct. 13-16, 1943, p. 159-169.

The distribution of the galvanic corrosion of a nickel-to-steel couple in open, slowly moving, tap water was estimated from measurements of potential differences in the water around the couple. Potential measurements can be made as soon as a steady state is reached, but it usually takes considerable time for corrosion to become extensive enough for thickness measurements to be accurate.

V. MATTACOTTI, FRANK K. SAVAGE

Tin Plating from the Potassium Stannate Bath. By FREDERICK A. LOWENHEIM. Electrochemical Society—Preprint 84-13 for meeting Oct. 13-16, 1943, p. 111-125.

The effects of changes in bath composition upon the operating characteristics of the potassium stannate tin plating bath are reviewed and new data offered concerning the effect of tin content on the anode efficiency. All results reported are based on very thin deposits, since the work is directed toward the application of electrotinning steel strip. The effect of foreign ions is investigated. Full-scale plant experience with the bath is reviewed.

V. MATTACOTTI, FRANK K. SAVAGE

The Electrogalvanizing of Strip Steel. By ERNEST H. LYONS, JR. Electrochemical Society—Preprint 84-12 for meeting Oct. 13-16, 1943, p. 101-110.

The early history of the electrogalvanizing of strip steel demonstrates its advantages, namely, extremely uniform coatings of any desired weight, which will withstand severe forming. The cleaning of the steel and the arrangement and operation of the plating tank are outlined. The nature of the somewhat heavier deposit on the edge of the strip is discussed.

V. MATTACOTTI, FRANK K. SAVAGE

Electrodeposition of Cobalt-Tungsten Alloys from an Acid Plating Bath. By M. L. HOLT, R. E. BLACK and P. F. HOGLUND. Electrochemical Society—Preprint 84-15 for meeting Oct. 13-16, 1943, p. 139-147.

Cobalt-tungsten alloys have been electrodeposited from a cobalt-tungsten plating bath which was prepared by adding sodium tungstate to a modified Kalmus type cobalt plating bath. Changes in alloy composition and cathode current efficiencies were studied at various current densities, bath pH's and bath temperatures. A typical satisfactory bath contained 1 to 2 g./L tungsten with electrolysis carried out at a bath pH of 3.5 to 4.5, a bath temperature of 65 to 70° C. and a current density of 3 to 4 amp./dm.

V. MATTACOTTI, FRANK K. SAVAGE

Electrodeposition of Copper Powder. By W. H. OSBORN and S. B. TUWINER. Electrochemical Society—Preprint 85-5 for meeting April 13-15, 1944, p. 41-50.

A new type of copper powder has been produced. Powder production is made a part of the process of electrolytic refining of copper. In a sense, therefore, the powder is a by-product of the refining operation. Great potential economy is possible, but can be realized only with large scale production of this powder which in turn awaits development of uses for the powder. Laboratory development is discussed historically. The authors' preferred method is to apply castor oil, previously oxidized with a small amount of perchloric acid, to a rolled sheet cathode and then electrolytically deposit copper as a powder, using the same equipment and electrolyte used in the multiple system of copper refining. The product is a mass of fine metal flakes which are coated with the oil used upon the cathode. The powder is useful as an intermediate for bronze powder but does not have the properties necessary for sintered metal products.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Copper in Powder Metallurgy. By J. J. CORDIANO. Electrochemical Society—Preprint 85-4 for meeting April 13-15, 1944, p. 31-40.

After describing briefly the three methods of making copper powder: (1) by electrolysis, (2) by reduction of the oxide, and (3) by atomization, results are reported on the effect of particle size and shape of copper powders. The maintenance of close specifications in copper powders has required years of patient research and development. Then follows a description of the production of porous bearings; tungsten-copper electrode tips; and steel-backed copper-base bearings. The products are used for bearings, motor brushes, grinding wheels, clutch facings, etc. Tables of physical properties of finished parts are appended.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Pure Columbium. By CLARENCE W. BALKE. Electrochemical Society—Preprint 85-3 for meeting April 13-15, 1944, p. 25-30.

After separting columbium from tantalum and other constituents by fractional crystallization of complex salts and fractionation of metal chlorides at elevated temperature, a very pure columbium oxide is obtained. A new process for reducing this oxide to pure columbium metal is described. This method is based on the fact that when an intimate mixture of columbium carbide and columbium oxide is heated in a vacuum columbium metal is produced. This is then converted to columbium metal powder and into columbium metal bars by powder metallurgy. A white, soft, ductile metal is finally obtained whose applications are briefly considered.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Laboratory Evaluation of Corrosion Resistance of Bearing Alloys. By L. M. TICHVINSKY. Electrochemical Society—Preprint 85-2 meeting April 12, 15, 1944, p. 10-24.

This paper describes testing equipment and procedures used at the U. S. Naval Engineering Experiment Station for laboratory determination of corrosion characteristics of bearing alloys. The evaluation of corrosion resistance for bearing alloys in wartime is especially important because of forced engine operation at elevated temperatures and the use of substitute materials. This is particularly true in the case of diesel engine manufacture which requires huge quantities of construction materials needed to meet the unusually large wartime expansion.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Current Efficiency in a Series of Electrolytic Cells. By J. F. GALL. Electrochemical Society—Preprint 85-1 for meeting April 12-15, 1944, p. 1-7.

Electrolytic cells are frequently operated in series with cascade flow of electrolyte. In this paper the relations between number of cells in flow series and the overall current efficiency of the series are developed mathematically. Where current efficiency is independent of product concentration, no advantage in overall

current efficiency will result from the use of series flow. If current efficiency decreases with increasing product concentration, significant advantage may accrue from the use of series flow. Illustrations are presented from studies on persulfate and on hypochlorite cells.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Strip Steel Electroplating With a Sodium Stannate Bath. By C. E. GLOCK. Electrochemical Society—Preprint 84-27 for meeting Oct. 15, 1943, p. 300-304.

The sodium stannate bath has been used in tin plating thousands of tons of strip steel. The satin "as plated" tin surface has decorative possibilities but for sanitary cans the plate is finished mirror bright by a simple fusion process. The preparation of the steel strip for plating is an important step and is discussed at length. The smoothest steel surface will yield the best mirror plate. The bath is maintained at its proper tin concentration by regular additions of caustic soda. The temperature of the bath ranges between 82° and 93° C. to ensure high efficiencies. The cathode efficiency is 92%.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Characteristics of Electric Apparatus Used on Electro-Tinning Lines. By G. E. STOLTZ and W. G. COOK. Electrochemical Society—Preprint 84-26 for meeting Oct. 15, 1943, p. 284-300.

Electro-tinning of strip steel presents a special problem to the electrical engineer. The current supply to the plating tanks must be regulated and controlled. Similarly, the electric motors that drive the steel strip through the tanks must be regulated and controlled to ensure uniform high quality tin deposit. Finally, the power supply to the induction heating equipment for "flowing" the tin plate must be varied as the travel speed of the steel strip varies. All three cases are discussed in detail and special electric apparatus for each case is recommended. Finally, a small auxiliary photoelectric cell equipment is described which is used for the detection of pinhole-sized perforations in the plated steel strip. For the conversion of the a.c. power supply into low voltage d.c. (6 to 12 volts) for the plating tanks, the cuprous oxide ("rectox") converters are specified.

VINCENT MATTACOTTI, FRANK K. SAVAGE

A Sulfate-Chloride Solution for Iron Electroplating and Electroforming. By R. M. SCHAFFERT and BRUCE W. GONSER. Electrochemical Society—Preprint 84-25 for meeting Oct. 16, 1943, p. 267-281.

A sulfate-chloride iron electrolyte has been developed, having the composition: ferrous sulfate, 250 g./L; ferrous chloride, 42 g./L; ammonium chloride, 10 g./L. Although the bath is particularly applicable to electrotyping and surfacing of stereotypes, other applications are suggested. The bath remains stable over long periods, and iron deposits produced are less brittle than with either normal sulfate or chloride baths. Operating conditions, characteristics of the bath, and character of the deposits are discussed.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Corrosion of Tin-Nickel Alloy Coatings on Steel in Canned Foodstuffs. By H. R. COPSON and W. A. WESLEY. Electrochemical Society—Preprint 84-23 for meeting Oct. 15, 1943, p. 242-254.

The galvanic behavior of steel coupled with tinplate, tin-nickel alloy coatings and nickel was observed during exposure to typical corrosive canned foodstuffs under anaerobic conditions. The results indicated that the alloy coatings were anodic to bare steel in four of five foods tested and not appreciably cathodic in the fifth. This, together with observations of the degree of corrosion which occurred, led to the conclusion that nickel-tin coatings are potential substitutes for heavier tin coatings so that a substantial saving in tin may be possible. The tin content of the alloy coating is useful in overcoming the noble potential of pure nickel and to take advantage of the marked inhibiting effect of tin compounds upon the corrosion of steel laid bare at pores, bends and defects in the coatings.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Continuous Plating of Fine Steel Wire With Nickel. By JAMES H. CONOLLY and RICHARD RIMBACH. Electrochemical Society—Preprint 84-22 for meeting Oct. 15, 1943, p. 234-240.

Due to the scarcity of nickel a nickel-plated steel wire is used today in place of solid nickel wire for tungsten filament supports in incandescent lamps. The steel wire passes through a concentrated Watts' nickel plating bath at the rate of 12 ft./min. (90 mm./sec.); at a current density of 200 to 600 amp./sq. ft. (22 to 65 amp./dm.); a bath pH of 2.0 and a bath temperature of 60° C. A very adherent nickel deposit (0.005 mm.) is obtained that may be safely subjected to sharp bends and which satisfactorily protects the steel basis during the life of the lamp.

VINCENT MATTACOTTI, FRANK K. SAVAGE

The Electrolysis of the Nitroparaffins. By RALPH PEARSON and WARD V. EVANS. Electrochemical Society—Preprint 84-21 for meeting Oct. 15, 1943, p. 228-231.

The lower aliphatic nitro compounds are good ionizing solvents capable of being electrolyzed if a base is added to cause ionization. The cathodic product is the N-alkyl hydroxylamine. The anodic product is the carbonyl compound corresponding to the nitroparaffin and nitric oxide. Low current yields are due to the oxidation of the N-alkyl hydroxylamine at the anode.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Pure Tungsten Direct from Tungsten Ore. By COLIN G. FINK and CHUK CHING MA. Electrochemical Society—Preprint 84-20 for meeting Oct. 14, 1943, p. 198-226.

The purpose of the present investigation was: (1) to find a simple method for the production of tungsten metal directly from tungsten ore; (2) to investigate new fused salt reagents for the decomposition of tungsten ores; and (3) to study the phenomena of tungsten crystal growth in a fused electrolyte bath. Experimental results showed that a WO_3 recovery of 98 to 99% can be obtained by fusing tungsten ores with alkali borate or alkali phosphate. On the other hand, the fused alkali carbonate bath for the electrolytic production of tungsten metal has several disadvantages: (1) low current efficiency; (2) low electrolytic conductivity; (3) rapid graphite anode consumption (due to the attack by carbonate ions); (4) "tungsten bronze" formation when an excess of tungstic oxide is employed; and (5) resolution of cathodically deposited tungsten in an excess of alkali oxide. Our experiments showed that crystalline tungsten from borate and phosphate baths can be produced electrolytically and economically. Tungsten ore of almost any type and of any grade, high or low, can be directly charged into the bath. The optimum conditions of temperature, composition of electrolyte and current density were determined.

VINCENT MATTACOTTI, FRANK K. SAVAGE

The Development of the Crucible Steel Electrolytic Tin Plate Process. By EDWARD W. HOPPER. Electrochemical Society—Preprint 84-19 for meeting Oct. 15, 1943, p. 191-196.

Electrolytic tin plate has numerous advantages over hot dipped tin plate. It can be produced in light coating weights not possible with any other method and with much greater uniformity of tin coating. The Crucible Steel Company of America was the first to produce, commercially, brightened electrolytic tin plate.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Miccro protective coating materials always prove fully effective for the insulation of plating racks —regardless of what plating solution may be used. In some solutions, one material proves most satisfactory . . . in others a combination of Miccro coatings is recommended. It is because no one material could have the proper protective qualities to meet every solution-resistant requirement that a complete line of Miccro coatings was developed—and is available to meet the specific requirements of any plating plant.

Our "Manual of Protective Coatings" covers in full detail the insulation of plating racks used for every purpose. If you haven't received this useful, informative book, we will be glad to send you a copy. Your request should be made on your company letterhead.

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NEW Equipment Materials Supplies

ANODES AND PLATING CHEMICALS

A new booklet on anodes and plating chemicals, Bulletin AC-105 has been issued by the Hanson-Van Winkle-Munning Co., Matawan, N. J. This booklet includes data on their anodes of nickel, brass, copper, zinc, cadmium, tin, lead, silver and anodes for chromium plating.

The plating chemicals described include salts and chemicals for plating nickel, black nickel, zinc, cadmium, tin, lead and silver, also sodium cyanide.

Processes covered are: H-VW-M Bright Cobalt Nickel (High Cobalt, Type 5 and 9H); Mazic Bright Zinc; SB Zinc, Cadux Cadmium; Protecto Lead Concentrates; B-H Lead.

Another important item included in this Bulletin is the synthetic Resin Anode Bag. A section is devoted to Solution Control including data on the Jernstedt Electroplating Computer and a table giving the component parts in per cent by weight, of salts commonly used in electroplating.

RUST REMOVING AND METAL CLEANING

The American Chemical Paint Company recently published a four-page illustrated folder on Deoxidine — a product which made possible the first satisfactory finish on metal automobile bodies. This interesting folder tells why this type cleaner deserves your consideration.

Copy sent free on request to American Chemical Paint Company, Ambler, Penna.

STRIPPING COPPER PLATE

Several methods and processes have come into general use for removing copper from steel parts that have been copper plated for selective carburization. The W.P.B. urges that neither chromic acid and sodium cyanide be used for this purpose because of short supplies, but because of recent developments in regard to the availability of salts used in preparing stripping solutions, two methods which are especially timely are recommended by the Hanson-Van Winkle-Munning Co., Matawan, N. J.

1. *The H-VW-M Copper Deplating Solution*

This is an all-potassium salt solution prepared as follows:

Copper cyanide	4.0 oz./gal.
Potassium cyanide	8.4 "
Potassium hydroxide	2.0 "
Potassium carbonate	5.0 "

Operating Conditions

Temperature	180°F.
Tank voltage	2-2.2 volts
Anode current density—	50-60 amp./sq. ft.
Cathode-anode ratio	2:1
Free potassium cyanide—	2.4-2.6 oz./gal.
Cathodes—Steel sheet or empty ball anode containers which can be periodically returned to the plating tank.	
Agitation stirrer or agitator—	Mechanical motor
Tank	Steel
Time of stripping to strip .001" copper	15 minutes required

2. *The H-VW-M Immersion Method*

The copper plated work is immersed in a solution of 1 lb./gal. of liver of sulphur, for five to ten minutes. The articles are then rinsed and immersed in a solution of sodium cyanide 16 oz./gal., or potassium cyanide 21 oz./gal., for approximately five minutes. In tests with a steel panel having a .001" thickness of copper, the minimum immersion time in the liver of sulphur solution was seven minutes and in the sodium cyanide three minutes. Although the liver

of sulphur solution can be operated at room temperature, sulphide formation is hastened at elevated temperatures; 120°F. is suggested if it is convenient to heat the solution.

There are a number of other methods for stripping copper, both electric and non-electric. Chromic acid, for example, has been used to a considerable extent in the past both with and without current. Various combinations of sodium cyanide, caustic soda and tri-sodium phosphate have been recommended but in these cases the copper is not recoverable by plating on cathodes, and at the present time, salts for these dips may be difficult to obtain.

"KARBATE" GLOBE-TYPE VALVES

A "Karbate" globe-type corrosion resistant valve is now being manufactured by the National Carbon Company, Inc. Through addition of the valve to its list of products for the chemical and process industries, National Carbon has made it possible to install complete conveying and heat transfer systems constructed entirely of "Karbate" chemically inert materials.

The new globe-type valves, like "Karbate" tanks, heat exchangers, pipes, fittings, towers, and pumps, are resistant to practically all corrosive chemicals and are unaffected by extreme thermal shock.

The valves are available in 1 and 2 inch sizes. Tested to withstand 50 lbs. pressure, they are uniquely small and lightweight, with short face to face dimensions. "Karbate" valves are of graphite stock and are self-lubricating. The inert chemical properties of the material prevents corrosion-caused sticking of the moving parts, thereby cutting down the maintenance normally required to keep valves operating at full efficiency.

"Karbate" valves are equipped with adapter plugs for steam-heating those fluids that tend to crystallize or solidify when handled through unheated lines. Utilization of the adapter plugs for steam-heating the valve will prevent clogging and avoid shut-downs while valves are dismantled and cleaned.

NEW SPECIMEN TABLE FOR TABER ABRASER

A new type specimen table for the Taber Abraser that permits testing paper products in moist or wet condition has been announced by Taber Instrument Corporation, North Tonawanda, New York.

This specimen table holds a sufficient amount of water to cover the specimen when performing "wet tests."

The wearing action is performed by dual Calibrase wheels bearing against the specimen under constant pressure, revolving in opposite directions, one sliding radially toward the outside, the other sliding toward the inside of the wear path. Each wheel revolving at a steady constant speed through contact with the specimen, exerts a combined abrasive, compressive and twisting action twice in each revolution of the specimen holder. Because the specimen holder travels a complete 360 degree circle, the wear due to differences of grain or weave are fully revealed. A standardized load adjustment is provided for varying the pressure of the Calibrase wheels against the specimen so the Abraser will test both delicate and tough materials with equal precision.

The results of tests are reported either numerically as the number of "wear cycles" to produce a given amount of wear, or as "loss in weight" when weighed on a precision laboratory balance.

The Taber Abraser is self-contained and is ready to operate by simply plugging into any electrical line. Simplicity of operation and calculation make this instrument ideal for laboratory tests and sales demonstrations.

Complete information on the "Taber Abraser" is available by writing Taber Instrument Corporation, North Tonawanda, New York, for bulletin 4012.

IRIDITE

Now protecting U. S. military equipment the world over, Iridite, a recently developed anti-corrosive treatment for zinc or cadmium surfaces, vastly increases the field of usefulness of zinc and cadmium coatings.

Iridite, developed and manufactured by Rheem Research Products, Inc., of Baltimore, is used both as a final finish and as a paint base. As a final finish it saves painting many parts of war equipment formerly required to be painted. With camouflage requirements, in mind, Iridite has been developed in two natural colors: Army olive drab and a lustreless jet black. As a paint base,

Iridite prevents zinc from "poisoning" the paint, and prevents the formation of any soapy, chalky underlayer that destroys all adhesion.

Iridite is applied by simple dipping. Times range from 10 to 60 seconds, and temperatures from 75°F. to 100°F. A brief rinse in hot water eliminates drying problems and completes the process. Parts may be handled or shipped as soon as they are dry. The protective solution does not alter dimensions or the texture of final finishes by more than a 3/100,000 of an inch, its developers assert. They also claim extreme flexibility; parts treated with Iridite can be bent or twisted without chipping, flaking, or in any way affecting its corrosion-resistant qualities.

Iridite meets military specifications AN-P-32 and 57-0-2C. It has also been accepted and specified for use by a number of large industrial concerns. Rheem Research sees increased use of Iridite on zinc or cadmium surfaces both on war materiel and on civilian products that are exposed to weather or corrosion.

WALRUS LEATHER NOW AVAILABLE FOR METAL FINISHING

War-time conditions have made it difficult to obtain walrus hides and to tan them thoroughly for polishing metal surfaces. Metal finishers will be interested to learn that these difficulties have now been overcome by an improved process. This method of tanning produces especially long-wearing, tough, flexible leather for polishing wheels or bobs. The close, firm grain of this specially tanned leather results in a more lustrous and durable mirror finish than can be obtained by any other material. This walrus leather is furnished in any thickness from ½" to 1¼" for any size wheel or bob, by Greene, Tweed & Co., 4377 Bronx Blvd., New York 66, N. Y.

PORTABLE RADIOS MADE WATERPROOF

What's good for attaching De-Icers to airplanes is also good for fastening straps to portable radio sets, a Chicago radio manufacturer has discovered.

Experimenting with the rivnut, one-piece combination rivet and nut plate originally developed by the B. F. Goodrich company for use in its De-Icer installations, the manufacturer found that when the straps were attached with rivnuts his radio sets became waterproof, could be completely submerged without any water seeping into the set. He has purchased 150,000 of the rivnuts and is making a study to find further possibilities for their use in his industry.

This is one of a wide variety of new rivnut applications discovered since they were made available for general use only a few months ago, according to Harold F. Mosher of the Goodrich industrial products division. They were invented nine years ago, but De-Icer manufacture and the airplane industry had been consuming the entire supply until recent production increases were attained.

Rivnuts can be inserted and locked into place by a bulge or head produced by a special tool, while working entirely from one side. They are threaded inside to serve as a nut plate. Not only can they be readily fixed in place where one side of the work is impossible or difficult of access, but a new spline type of rivnut has been developed which can be locked into a block of wood or plastic. A hole is drilled into the wood or plastic, the rivnut pounded into it and "headed" with the special tool. Tests have indicated, Mosher said, that in most woods these rivnuts cannot be dislodged by a 500-pound pull.

INDUSTRY NEWS

PENN SALT OPENS CINCINNATI SALES OFFICE

The Pennsylvania Salt Manufacturing Company announces that it will open a district sales office at Cincinnati, Ohio, in the Carew Building to serve the territory including South-eastern Indiana. Southwestern Ohio, and the major part of Kentucky.

Louis M. Kuilema, who has been appointed District Sales Manager in charge of the office, was formerly with the Paper Makers Chemical Department of the Hercules Powder Company and has been in the executive offices of that Company in Wilmington, Delaware, for the past seven years. Kuilema is a native of Kalamazoo, Michigan, and attended Kalamazoo College and Western Michigan College. He is married and has two children. Before his entrance into the chemical business, Kuilema had been associated with the U. S. Pressed Steel Products Company and the Kalamazoo Stove Company.

POWELL MADE HARVILL V. P.

Appointment of Max Powell as vice president in charge of technical research for Harvill Corporation, pioneer Los Angeles die casting firm is announced by C. K. Pistell, president.

Powell also retains his former duties as head of standard controls and chief metallurgist. He has been associated with Harvill Corporation for the last five years and installed the research department and laboratory when the new plant was opened. At present Powell is primarily concerned with development work, both for the company's war duties and, as a parallel program, in adapting the advantages of die casting to peacetime products. He is a member of the American Society of Metals and of the American Society of Testing Materials.

JEAN WYNKOOP ADDED TO TURCO ORGANIC RESEARCH STAFF

Miss Jean Wynkoop recently was appointed to the Los Angeles Organic Research Staff of Turco Products, Inc., of Los Angeles, Chicago and Houston, according to S. G. Thornbury, President and Technical director.

Miss Wynkoop recently received her M.A. degree from the University of Southern California for her work on industrial water softeners. While completing her studies, Miss Wynkoop devoted part of her time to laboratory work in the Turco plant and thus is thoroughly acquainted with the synthesis of industrial chemical compounds.

Previously, Miss Wynkoop took her A.B. degree at Whittier College, was Assistant Research Librarian at Union Oil Company in Wilmington, California, and an instructor in mathematics at Marlborough School for Girls.

AWARD GIVEN HARPER CO.

The fourth award for excellence in war production was granted June 20, 1944 to the employees of The H. M. Harper Company, non-ferrous bolt and nut manufacturer, 2620 Fletcher Street. Chicago 18, Illinois. This was one of the earliest fourth awards to Chicago manufacturers . . . and the first such award to any member of the entire bolt and nut industry.

This ceremony emphasizes the significant role played in war by small parts and accessories. Non-ferrous and stainless fastenings are indispensable in jeeps, tanks, ships and a host of other war equipment.

GENERAL SUPERINTENDENT

A large job-plating company in the Midwest is interested in a man of exceptional ability and broad experience

in all phases of plating, metal finishing and allied processes. The man we are looking for must know production methods and be able and willing to produce. To the right man, we can offer a substantial salary and unlimited opportunity for security in the postwar era. Tell us all about yourself stating age, salary expected, etc. so we can plan a personal interview at our expense. Box No. MR-8.

INDUSTRIAL FINISHES SALESMEN

Industrial finishes salesmen wanted: One for Chicago and surrounding territory, and one for Cleveland and surrounding territory. Wanted by an old, well established Eastern manufacturer of a complete line of lacquers, synthetics and other industrial finishes. Splendid opportunity for right man. Please state age, draft status, education, income expectations, and experience. When replying, address Box MR-8A.

METAL CLEANER—SALES SERVICE MEN WANTED

We have several excellent opportunities available in this rapidly expanding department of our business. Apply by letter giving details of your experience.
THE COWLES DETERGENT COMPANY
7016 Euclid Avenue Cleveland 3, O.

WIECZOREK TO CHEMICAL CORP.

Mr. Wieczorek has been employed by the Chemical Corporation to service the metal finishing trade in Connecticut with respect to chemicals and cleaning equipment for metal finishing. He has had a very wide experience in all phases of this industry through his many years of association with The Stanley Works in New Britain. More recently he served as Chief Chemist and Production Manager for the Pape Electro-Plating Company in New Britain, Conn.

CARROLL REPRESENTS ROBERTS ROUGE

Mr. John W. Carroll has opened an office at 845 Law Bldg., Kansas City, Mo. and will represent the Roberts Rouge Co., Stratford, Conn., manufacturers of Buffing and Polishing compositions.

He was born in Dallas, Texas and graduated from Austin College with the Class of 1917. Later, he attended Washington University at St. Louis, Mo. and Columbia University, N. Y. In World War I, he served as 2nd Lieut. Field Artillery.

He had connections with Monsanto Chemical Co. of St. Louis for two years and during the next five years was Vice-President and Treasurer of Thermos Chemical Co. of St. Louis. During the next seventeen years, he held responsible positions in Wall St., New York, with two large Investment Banking firms, and later became associated with Pratt & Whitney Aircraft, East Hartford, Conn., and Kansas City, Mo.

During these years, he traveled extensively over the entire country and has many friends and business connections. Experience gained with Pratt & Whitney in the polishing and buffing line will make this new connection pleasant and successful.

Roberts Rouge Co. will have a warehouse in Kansas City, where a full line of all products manufactured will be maintained to more quickly service the large and rapidly expanding western business which this concern has enjoyed for some time.

CONVENTION FILM

The Annual Conference of the American Electroplaters' Society held at Cleveland, June 12 to 14 inclusive has been filmed completely by one of the best commercial photographers in northern Ohio. This film is in 16 mm. sound, capable of being projected on any standard projector such as Keystone, Bell & Howell, or Eastman, and is being offered for showing by its sponsors, The Lea Mfg. Company, 16 Cherry Ave., Waterbury 86, Conn.

The Conference is completely filmed. Well known people from the entire industry were present at Cleveland and you will see their smiling faces beaming at you. Excellent shots were made of the Registration, Ladies' parties, Room parties, International Fellowship functions, Annual Banquet, and, last but not least, the very excellent floor show which culminated the Banquet.

Any branch of the society or any other group of interested people may

borrow the film by writing to its sponsors, The Lea Mfg. Co., 16 Cherry Ave., Waterbury 86, Conn. It will be available for showing, completely titled, after September 1, 1944. The sponsors state that it will be necessary to allot the film, of which there is only one copy, in the order in which requests are received, so do not delay in writing for it.

ELECTRO-PLATING AND FINISHING EXPERT

Man with broad experience in all kinds of metal finishing operations, especially electro-plating needed by our technical service organization. Must be capable of meeting al types of problems encountered in metal industries in cleaning, processing and maintenance operations. Headquarters New York. Some traveling. Essential workers need release statement.

OAKITE PRODUCTS, INC.

LUSTER-ON FOLDER

The Chemical Corporation, 93 Broad Street, Springfield 5, Mass., announce for distribution a new 4-page folder describing their process Luster-on, for producing Chromium brilliancy on dull zinc surfaces. Copies of the folder may be obtained by writing the manufacturer direct. In describing the process the manufacturer says, "Use of Luster-on dip is not to be compared to a buffed surface; however Luster-on can be safely and satisfactorily employed to obtain brighter zinc than can be obtained by any known plating bath or any known bright dip, and it eliminates the necessity of the buffing operation. Through the use of Luster-on it is now possible to dip dull-plated surfaces and get a brighter finish than with conventional plating baths—even to producing a brighter finish on work already plated by patented processes."

WYANDOTTE CHEMICALS CORPORATION

J. B. Ford Division—Michigan Alkali Division announce the removal of their Philadelphia Office to 408-10 Liberty Trust Building, Philadelphia 7, Penna., effective June 30, 1944. Phone: RITenhouse 0826-0827.

FISHER FURNACE CO. BUYS MONARCH

The industrial furnace business of the Monarch Engineering and Manufacturing Company of Baltimore, Maryland, has been purchased by the Fisher Furnace Company of Chicago. The transaction gives the Fisher Furnace Co. all rights to manufacture Monarch Equipment and includes all patterns, drawings and parts inventories.

Future plans provide for the continued manufacture of certain specialized Monarch Furnaces with improved design features, and the continuation of a complete parts service for Monarch Furnaces now in operation. All Monarch Furnaces to be carried over into the Fisher Line will be subjected to a thorough revamp and modernization program by the Fisher Engineering Department at Chicago. Combined headquarters and manufacturing facilities will be located in the two existing Fisher plants in Chicago for the present.

The Fisher Furnace Company has engineered and manufactured a broad line of melting furnaces, blowers, refractories and allied equipment since 1906 and has, in recent years, pioneered much of the progress in melting nonferrous metals through its engineering and plant layout research.

COWLES—OHIO REPRESENTATIVES

The Cowles Detergent Company, Cleveland, Ohio announce the appointment of Charles W. Churchill as Cowles Technical Engineer for Northeastern Ohio and Western Pennsylvania territory. Charlie has a background of education and finishing experience which should be valuable to the many friends and customers of Cowles.

Clyde E. Lowe of Lakewood, Ohio covers Cleveland and Northwestern Ohio. He was born in Cleveland and educated at Mount Union College. Clyde's wide experience in metal cleaning, wire drawing and wire coating has fitted him well to handle the problems of the metal working plants in his territory.

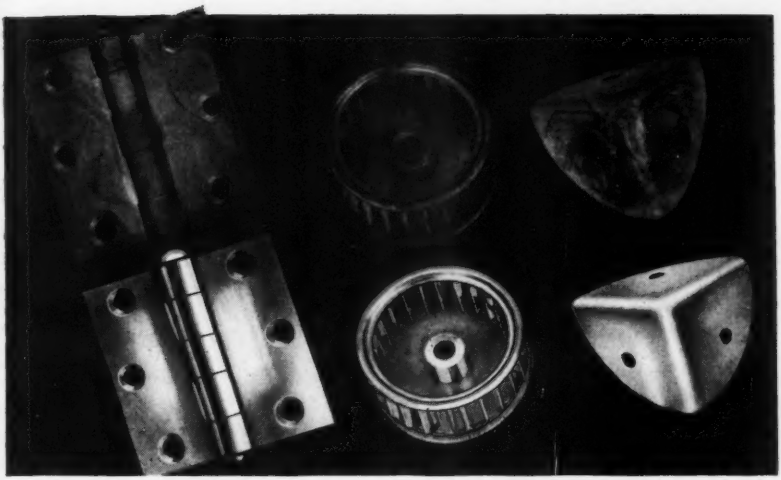
LIST OF AVAILABLE SPEAKERS—1944

Representing	*Speaker*	*Subject*	*Locality*	*Expenses*
Northwest Chemical Company	B. F. Lewis	Adhesion of Electrodeposits	Middlewest	Company
The Lea Manufacturing Company	Henry L. Kellner	Burring by Flexible Polishing with Greaseless Compositions	Middlewest & East	"
" " " "	Richard P. Crane	Burring Contributions to the War Effort and Post-War Potentials	"	"
Oakite Products, Inc.	To be chosen	Cleaning and Allied Operations	Any	"
Hanson-Van Winkle-Munning Co.	Myron B. Diggin	Plating and Electrochemical	Middlewest & East	"
" " " " "	Everett E. Carlson	" " "	East	"
" " " " "	Paul J. Lalonde	" " "	East	"
" " " " "	Raymond F. Ledford	" " "	Middlewest	"
" " " " "	Bernard C. Case	" " "	Middlewest	"
" " " " "	Allen T. Baldwin	Hot Galvanizing and Hot Tinning	Middlewest & East	"
" " " " "	Harvey K. Hunt	Cleaners and Cleaning Problems	Middlewest & East	"
Detrex Corporation	W. F. Newberry	Developments in Production Metal Cleaning Applications	Middlewest	"
" "	Chester W. Smith	Metal Cleaning Processes	Middlewest	"
" "	T. J. Kearney	Metal Cleaning Equipment Design and Construction Principles	Middlewest	"
" "	W. A. Vensel	Industrial Cleaning Procedures	South	"
" "	S. B. Crooks	Metal Cleaning Process Applications	West	"
Zapon Division of Atlas Powder Company	Wm. L. Hensley	Synthetic Resin Finishes & Lacquer Finishes	Middlewest	Company

Zapon Division of Atlas Powder Company	Wm. L. Hensley	Synthetic Resin Finishes & Lacquer Finishes	Middlewest	Company
MacDermid Incorporated	Henry Strow	Metal Cleaning	East	"
" "	Arthur W. Logozzo	Hard Chrome Plating Problem	East	"
" "	G. S. Krentel	Cleaning Problems	Middlewest	"
Lasalco, Inc.	B. G. Daw & Associates	Unannounced	Middlewest & East	"
Darco Corporation	W. A. Helbig	Activated Carbons	Middlewest & East	"
United Chromium, Inc.	To be chosen	1. Chromium Plating 2. Copper Plating 3. Zinc Plating 4. Anozinc and similar coatings 5. Use of stop-offs, masking 6. Stripping with Unichrome Alkaline Strip	Middlewest & East	"
Carborundum Company		Movie film: 1. First Principles in Grinding 2. The Romance of Industry		
General Motors Corporation	W. M. Phillips	Electroplating and Electrochemistry	Middlewest	"
	Geo. B. Hogaboom	The Influence of Metallurgy on Electroplating problems	Any	Branch
Indiana University	F. C. Mathers	1. Addition agents in Electroplating 2. Experimental Lead Baths 3. The Rarer Elements	Middlewest	Branch

All companies and people involved have requested that they be notified a sufficient length of time before a meeting so that they may arrange their affairs.

Having Trouble with STOP-OFF?
BUNATOL 608 is the answer to the plater's prayer for a successful Stop-Off for use in alkaline electro-plating solutions; one that sticks to the job without peeling; that holds firmly on a trimmed edge with no danger of seepage or creep of the deposited metal.
Quick air drying at room temperature. Brushes easily and covers irregular surfaces without bridging. BUNATOL 608 cuts costs,—increases production,—because of its superior chemical resistance and greater adhesion.
If you're having trouble with Stop-Off, try BUNATOL 608 in your own shop in alkaline plating of Copper, Zinc, Tin, Cadmium, Silver—Hard Chrome too. Write for sample on your letterhead right now. You'll be glad you did!
NELSON J. QUINN COMPANY
Toledo 7, Ohio
BUNATOL
608



The Luster-on treatment on zinc creates a new brightness . . . that stays bright . . . because it is passive.

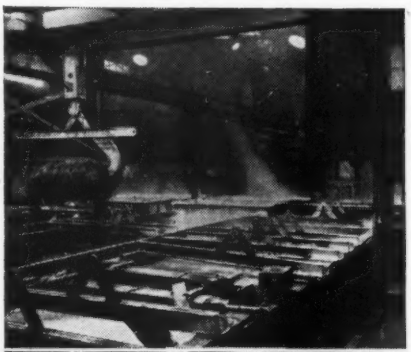
FOR SPEED AND BRILLIANCY IN A ZINC-BRIGHT DIP

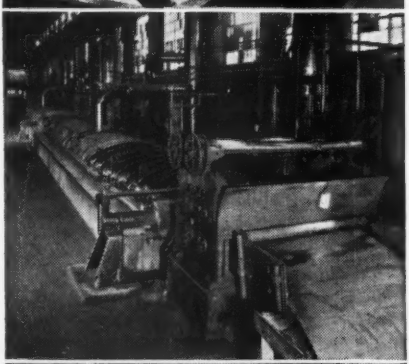
LUSTER-ON is the answer to modern industry's demand for a bright dip that is easy to use . . . inexpensive . . . long-lasting. Any operator familiar with acid dips for plating will welcome **Luster-on** . . . will be amazed at the improved brilliancy now obtainable on zinc surfaces.

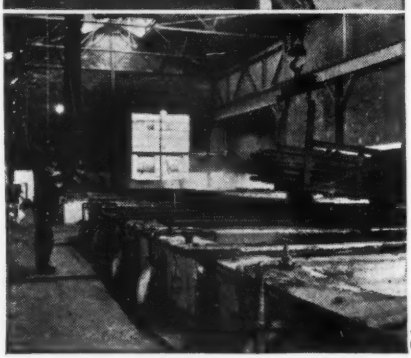
KEMO says: "Try **Luster-on!** The **Luster-on acid** bath is shipped promptly on order in convenient 13-gallon carboys; **Luster-on salts** in 100-pound or 400-pound drums. To prove our point . . . we'll process and return any sample piece shipped to us. Meets Specification A. N. P. No. 32, Amendment No. 2, for no white corrosion products."

THE *Chemical* CORPORATION
93 Broad St., Springfield 5, Mass.

RODINE *prevents*







Needless Waste

WHEN PICKLING WIRE, SHEET STEEL, STEEL TUBES OR STEEL PRODUCTS IN THE PROCESS OF FABRICATION

Briefly stated below are a few advantages from the use of RODINE.

Clean metal is not wasted in pickling.

Acid is not wasted in dissolving good metal.

Smoother, brighter, cleaner surfaces are produced.

Undue etching of the surface of threaded, machined or polished steel is avoided.

Over-pickling is eliminated.

Blistering of sheets is reduced.

Acid brittleness is minimized.

Uniform pickling is obtained under varying conditions.

Zinc can be stripped without injuring the basis metal.

The atmosphere is not contaminated with noxious corrosive gases.

There is a type of RODINE for every pickling problem, depending upon the kind and strength of acid used, upon the nature of the steel, and upon the scale or incrustation to be removed. ACP engineers will gladly recommend the proper RODINE for your particular problem.

Manufacturers of Inhibitors & Metal Working Chemicals

AMERICAN CHEMICAL PAINT CO.

AMBLER ACP **PENNA.**

Note: West Coast Plants may address inquiries and orders for prompt delivery to Leon Finch, Ltd., 728 East 59th St., Los Angeles, Calif.

ELECTRO ★ PLATERS

For Rapid, Safe, Efficient, Economical Metal Cleaning Use COWLES AP and EL Cleaners and LIXOL

SPEED, without sacrificing quality in preparing and cleaning steel parts for plating and other finishing, can be attained by the use of Cowles AP and EL Cleaners. They may be used with or without electrical current, direct or reverse. Cowles AP and EL Cleaners contain the correct quantity of wetting agent that forms a blanket over the solution tank to prevent fuming and also to allow maximum use of current available. Cowles LIXOL-emulsion solvent type Cleaner can be used to advantage as a pre-soak if necessary. Let the Cowles Technical Man make definite recommendations on your problems.

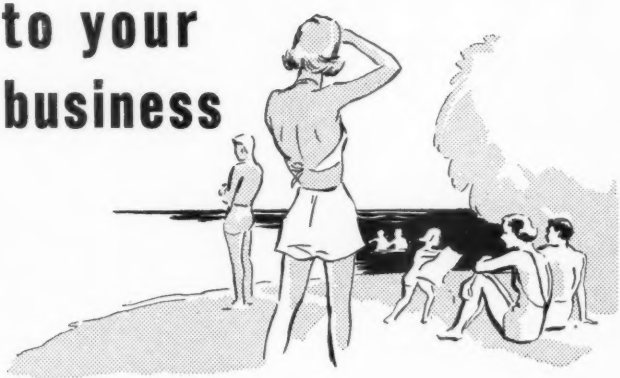
BUY MORE WAR BONDS

THE COWLES DETERGENT CO.

7016 Euclid Ave. Cleveland 3, Ohio

Metal Cleaner Dept.

Apply this health hint to your business



Your physician prescribes exposure to the summer sun as a means of storing up vitality and fatigue resistance. Storts prescribes exposure to soundly engineered construction and fine weldmanship as a means of assuring long life values in your welded fabrications. When there is no skimping on materials and workmanship, there is no additional cost for recurrent and periodical doctoring and doping, no unproductive days due to breakdowns. Top quality is a hidden reserve of endurance and of performance capacity.

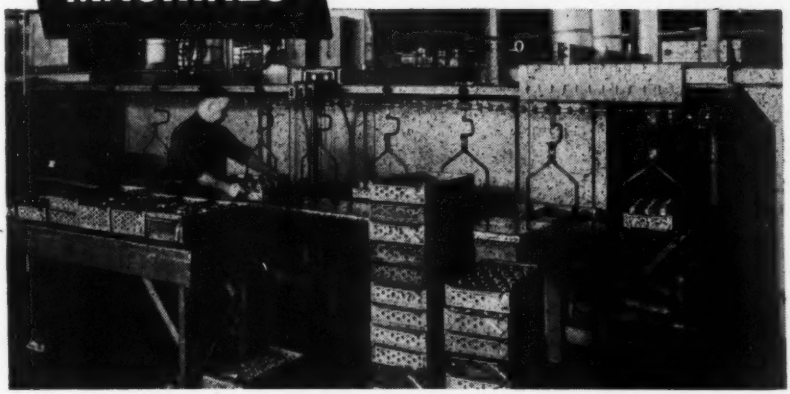
STORTS WELDING COMPANY

42 Stone Street Meriden, Conn.

Manufacturers of Welded Fabrications to Specification

INDUSTRIAL WASHING MACHINES

for faster... better plating!



★ ★ ★ **INDUSTRIAL Washing equipment meets today's needs for fast, dependable washing, cleansing, rinsing, dipping, slushing and drying.**

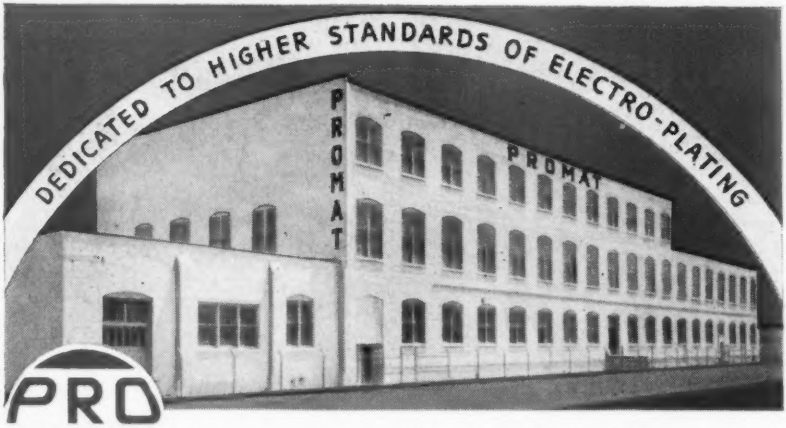
INDUSTRIAL units encompass five basic design patterns — Conveyor, Cabinet, Monorail, Rotary Drum and Vertical Types. This diversity of design provides perfect suitability to any application. Further, each machine is engineered from these standard patterns to the exact requirements of each installation. Basic standards for economy—custom building for efficiency.

Illustrated is an INDUSTRIAL Monorail washing and rinsing machine. This type can be built around existing carriers obviating additional costs. In plating processes, material can be transported continuously for cleansing, plating and drying without removal from the plating racks. The excellent cleaning effected with INDUSTRIAL equipment results in greatly increased efficiency in subsequent plating operations. One man operation substantially contributes to economy.

WRITE FOR ILLUSTRATED CATALOG. The extensive application of INDUSTRIAL units in many phases of industry and the war effort, are graphically depicted in the new 12-page Catalog just off the press. Send for your free copy today.

INDUSTRIAL WASHING MACHINE CORPORATION

289-293 BURNET STREET, NEW BRUNSWICK, NEW JERSEY



PRO MAT *produces the finest Plated Products!*

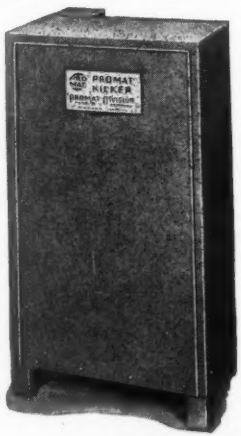
In our Waukegan home pictured above production of Promat equipment and electrolytes is on a large scale to keep pace with the ever growing use of the Promat Process. Promat has enabled plants, many flying the "E" Award, to increase their plating efficiency and quality of their war production.

Promat plates high current areas with practically no danger of burning—with uniform color over entire area of product—has exceptional adherence and better penetration. Promat has greater covering power, wider plating range, and produces smooth deposits. Promat produces these results in less time, with less effort, at lower production cost.

Promat is now doing its full share of war work. For post-war use, Promat Processes for other metals will have the same superior Promat characteristics.

Why not adopt the Promat Process in your plant? Promat installation is simple and can be accomplished with little effort in minimum time.

Send samples of your product for Promat Processing in our pilot plating plant for your inspection and tests.



The Promat Kicker is a single phase series circuit superimposition unit, designed to provide high amperage alternating current for the Promat Process. The Kicker has complete voltage regulation for the range required by the process, and is a rugged, high safety factor machine. There are no moving parts or other replaceable elements, and the machine will operate for years at its rated capacity.

IMPORTANT! A new booklet, No. 20M, describing the Promat Processes, with pictures of our new plant, is on the press. May we send you one?

PROMAT DIVISION, Poor & Company

851 SOUTH MARKET STREET, WAUKEGAN, ILL.

DISTRIBUTORS:

C.F.R. Sales Co., 262 Laurel Ave., Kearny, N. J.
Crown Rheostat & Supply Co., 1908 Maypole Ave., Chicago, Ill.
Wagner Bros., 1249 Holden Ave., Detroit, Mich.

BRANCH NEWS

Business and Social News • Educational Activities

DAYTON BRANCH

The regular meeting of the Dayton Branch was held July 14, 1944 at the Engineers Club. There were eighteen (18) members present.

The meeting was called to order by the President, Mr. Neil, who also gave a report on the convention. The members were glad to hear that Dayton Branch was awarded second prize in the exhibit competition.

Mr. Byron A. Bowman of Aeroproducts was elected to active membership.

The meeting was turned over to the librarian, Mr. Lucas, who introduced the speaker of the evening, Mr. H. W. Kennedy, of E. I. Du Pont De Nemours Company. Mr. Kennedy spoke on the Lead Sulfamate plating solution. This was an interesting paper and was followed by an interesting discussion.

HERMAN E. AUSTEN, *Reporter*

NEWARK BRANCH

The regular meeting of the A.E.S. Newark Branch was held at the Robert Treat Hotel, Newark, New Jersey, on June 2nd, 1944. The meeting was called to order by First Vice President, Louis Donroe. President Robert Sizelove being absent.

The minutes of the previous meeting were read and approved. All bills presented were voted to be paid.

The Application of George Miller to active membership was voted to take the regular course. The applications of Robert A. Ehrhardt, Robert C. Kuster and William D. Wilson to Associate membership were also voted to take the regular course.

The transfer of Harold Blanchard from the Boston Branch to Newark Branch was presented and accepted.

The resignation of Augustus Dulje and Charles Kopp were presented and accepted.

The Amendments proposed to the Constitution were discussed for the benefit of the Delegates.

Ed Washburn announced that more information for the 1944-45 Year Book had been contributed.

A question box was next conducted by our Librarian which proved to be very interesting and educational.

The meeting was adjourned at 11:15 P.M.

GEORGE WAGNER, *Secretary*

INDIANAPOLIS BRANCH

The Indianapolis Branch A.E.S. held its monthly meeting at 8:00 P.M., Wednesday, May 3, 1944, at the Hotel Riley. Twenty-seven people attended the dinner preceding the meeting and thirty-one members and friends attended the business meeting. President Thomas Evans called the meeting to order.

The meeting consisted of the usual business, report and discussion on the dinner-dance to be held May 20, at the Indianapolis Athletic Club, report of nominating committee and election of officers, and a very interesting talk on "Recent Developments in Electroplating" by Mr. A. L. Critchfield of United Chromium, Inc.

The minutes of the last meeting were read and approved. H. J. Green was elected to active membership. The amendments to the constitution as proposed by the Newark branch were read and discussed. It was moved and seconded and the vote was carried that the Indianapolis delegates go to the national convention in June uninstructed as to how to vote on the amendments to the constitution of A.E.S. as proposed by the Newark branch.

The delegates appointed to represent the Indianapolis Branch at the national convention were Anthony Fritz, Thomas Evans, and Harry Green and the alternate delegates were Wes Cothrum, Al Caldwell, and Walter Gullison.

It was suggested that the secretary have the return address on all correspondences and that he send notices of

meetings, etc., at least ten days ahead of events.

A short discussion was held concerning publication of a directory to be presented to the membership at the September meeting. A motion from the floor was made and seconded and the vote was carried that a directory be printed and presented to the members of the A.E.S. at the September meeting. The publication committee consists of Al Caldwell, Ed Bruck, and Carl R. Morris.

A report was made by Walter Binai on the progress of the dinner-dance to be held May 20, 1944, at the Indianapolis Athletic Club. He said that 98 tickets had been sold and also suggested that every one sell two more tickets so that the dinner-dance would be a great success both socially and financially.

The board of governors consisting of Walter Binai, Ed Bruck, and Wes Cothrum presented their selection of candidates for the 1944-45 season. By a unanimous vote of the society the candidates as suggested by the nominating committee were voted into office. The officers of the society turned their respective offices over to the new officers.

Paul V. Jewell suggested that the body give a hand in appreciation of the excellent services rendered by the retiring officers which was met with great approval by the members.

The officers for the 1944-45 year are as follows:

President—L. A. Chesterfield
Vice-President—Thomas Evans
Secretary-Treasurer—Carl R. Morris
Librarian—Wes Cothrum.

The board of governors for the coming year consists of Al Caldwell, H. J. Wiesner, and Walter Gullison.

The meeting was turned over to James Monegal, Librarian, who introduced the speaker of the evening, Mr. A. L. Critchfield of United Chromium, Inc. Mr. Critchfield gave a very interesting concise talk entitled "Recent Developments in Electroplating."

He pointed out that the pyro-phosphate plating baths are being developed extensively and that the copper and zinc pyrophosphate baths are suitable for production purposes, and that the same are now in use. He gave general formulae of copper and zinc pyrophosphate plating baths, working conditions of baths, difficulties encountered with baths, and pointed out some of the advantages of the copper and zinc pyrophosphate baths over the copper and zinc acid and cyanide baths. He also talked on protection of zinc coatings by the so-called anozinc processes patented by United Chromium, Inc. and told of the advantage of the anozinc processes.

A brief discussion on copper and zinc pyrophosphate plating baths and the anozinc processes immediately followed the talk with all questions directed to the speaker.

The meeting was adjourned at 10:30 P.M.

CARL R. MORRIS,
Secretary-Treasurer

CHICAGO BRANCH

The Chicago Branch held its regular meeting Friday, July 14th at the Atlantic Hotel.

President R. J. Hazucha presiding and all other officers were present.

Mr. M. H. Longfield was installed into the office of secretary of the branch.

A motion was made and carried that all active members receive a certificate of membership.

Our Librarian had some movies of some of the conventions held in various cities. They proved to be very interesting and entertaining.

Refreshments were served after the movies.

The following questions were in the question box:

No. 1—Tin plating steel .0003" thick. 20-40 amp./sq. ft., 170 F., 14.5 oz./gal. sodium stannate, 2 oz./gal. sodium hydroxide, peroxide present. Carbon treatment improves the deposit but what will correct a coarse crystalline deposit?

Answer—If there is sludge in the bottom, it should be filtered off and the clear solution built up to proper analysis.

No. 2—Is there any method of testing zinc and cadmium anodes to determine the difference?

Answer—Put a drop of hydrochloric acid on the anode and when the action has stopped, add a drop of strong sodium sulphide. A white precipitate is zinc and a yellow precipitate is cadmium.

M. H. LONGFIELD, *Secretary*

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1—5000/2500 AMPERE, 5/10 VOLT, **CHARLES J. BOGUE ELECTRIC CO.** Motor Generator Set. Full Panel-Board Arrangement. Excellent Condition.
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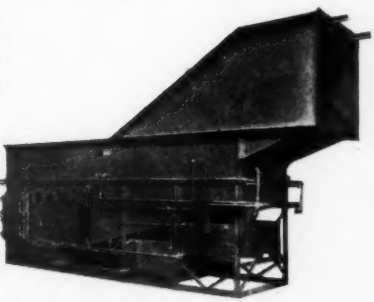

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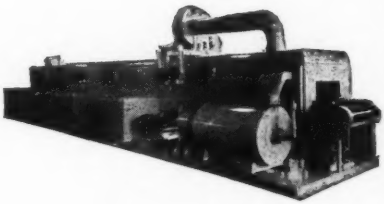

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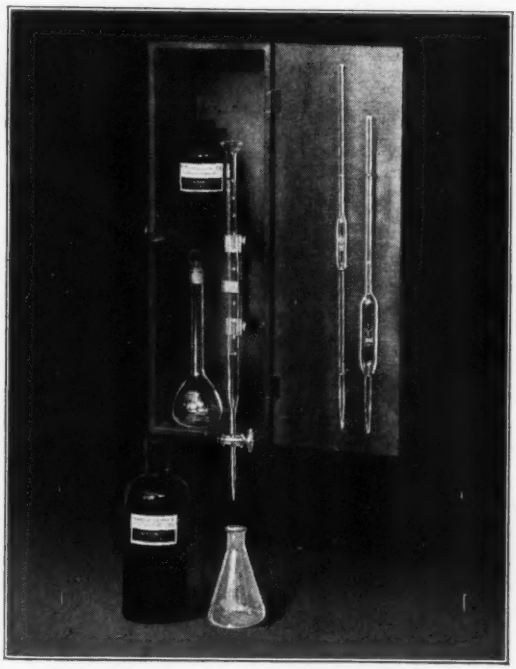

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These cleaning materials are used with equal efficiency on other non-ferrous metals where freedom from etch and tarnish are essential.

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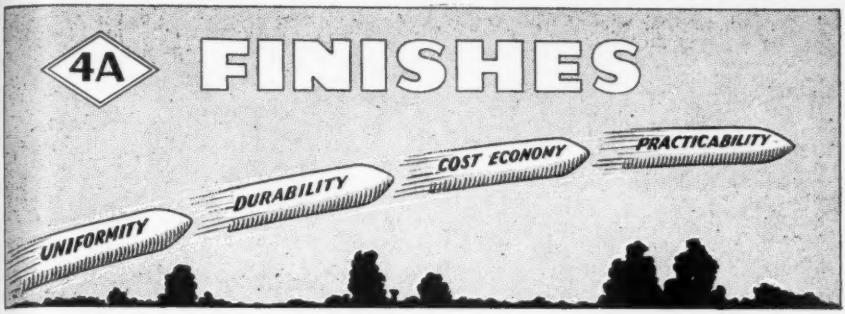

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TRUED OR UNTRUED

Write for Bulletin MR-844

Divine Brothers Company
UTICA 1, N.Y.

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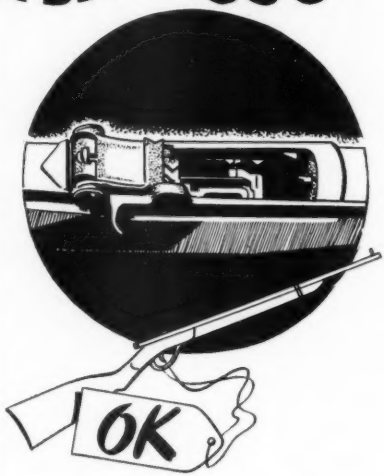

Cut the color before chrome plating
Produce a high luster after plating

PURICO #550 is a comparatively dry composition bar unexcelled for all precision cleaning of gun parts, surgical instruments and other similar products prior to hard chrome plating. The special qualities of #550 eliminate many of the usual pre-finishing operations thereby speeding up and improving the finished product.

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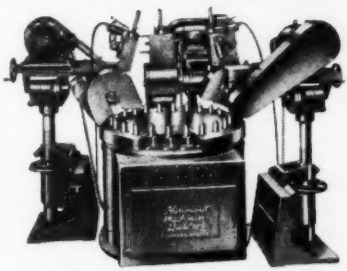

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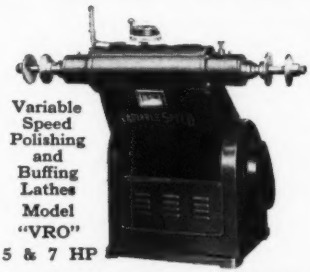

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MEMBERSHIP REPORT

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To August 1944

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EDWARD B. SILLS, c/o Master Finishers, Inc., 2427 S. Prairie Ave., Chicago, Ill., Associate
STEPHEN F. O'CONNOR, c/o Western Electric Co., 245 R. St., Lincoln, Neb., Associate
EDWARD R. KRAFT, 20 E. Jackson Blvd., Chicago, Ill., Associate
LLOYD O. GILBERT, 821 E. Central Park Ave., Davenport, Iowa, Active
STANLEY STACH, 6953 S. Peoria St., Chicago 21, Ill., Active

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VIRGIL C. HUTTON, 51 S. Dixie Ave., Dayton, Ohio, Associate
GORDON C. HUGHES, 548 Evergreen Ave., Dayton 7, Ohio, Active

Newark Branch

GEORGE MILLER

Philadelphia Branch

JOHN FUSSELMAN, 6446 Ogontz Ave., Philadelphia, Pa., Associate
FRANCIS J. HAROLD, 1661 Henvis St., Philadelphia, Pa., Associate
WILLIAM F. MERSHON, 1221 North Street, Philadelphia, Pa., Active

CHANGE OF STATUS

Rochester Branch

ROBERT GRAHAM from associate to active membership
DAVID PENN from associate to active membership
BARNARD SHENKEL from associate to active membership
ROBERT YORKELY from associate to active membership

RESIGNATIONS

Bridgeport Branch

MILTON T. VREELAND

Philadelphia Branch

WALTER C. GOLD

DEATHS

San Francisco Branch

MR. C. L. HENSHALL, JR., 2316 - 103 Ave., Oakland, Calif., Associate

MEMBERSHIP CHART

BRANCH	May 1943	Change in Membership	Percent Change
SYRACUSE	51	+ 8½	+16.6
INDIANAPOLIS	74	+ 9	+12.
LOS ANGELES	123	+10	+ 8.1
NEW HAVEN	95	+ 6	+ 6.3
DAYTON	100	+ 6	+ 6.
TORONTO	109	+ 6	+ 5.5
PHILADELPHIA	138	+ 7	+ 5.
CHICAGO	323	+15	+ 4.6
PROV.-ATTLEBORO	66	+ 3	+ 4.5
BOSTON	130	+ 5	+ 3.9
DETROIT	336	+11½	+ 3.4
CINCINNATI	63	+ 2	+ 3.1
NEW YORK	158	+ 4½	+ 2.8
WATERBURY	111	+ 3	+ 2.7
NEWARK	198	+ 4	+ 2.
BRIDGEPORT	102	+ 2	+ 1.9
GRAND RAPIDS	109	+ 2	+ 1.8
BUFFALO	80	+ 1	+ 1.2
ROCHESTER	83	+ 1	+ 1.2
MILWAUKEE	97	+ 1	+ 1.
CLEVELAND	115	+ 1	+ .86
BALTIMORE-WASH.	107	+ ½	+ .46
HARTFORD	114	—	—
ST. LOUIS	111	—	—
SPRINGFIELD	79	—	—
PITTSBURGH	68	—	—
JACKSON-LANSING	51	—	—
TOLEDO	42	—	—
SAN FRANCISCO	39	—	—
ANDERSON	23	—	—
MONTREAL	50	— 2	— 4.
LANCASTER	40	— 2	— 5.

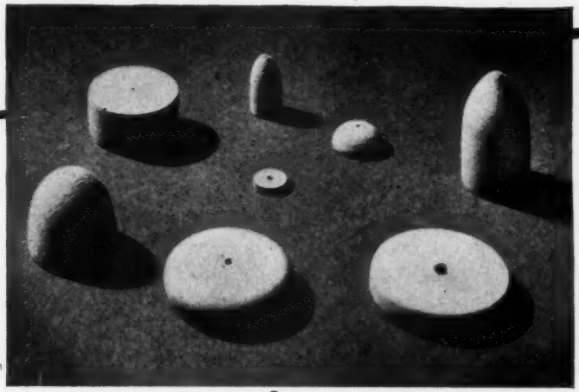
MEMBERSHIP MAY 1, 1944	=	3385
MEMBERSHIP AUGUST 1, 1944	=	3490
GAIN IN MEMBERSHIP	=	105
Per Cent of Gain 3.1%		

BA

WIN

AUGUS

SMALL . . . but what a Grand Production Job They're Doing



The tiny felt bob has been a life-saver for hundreds of plants faced with stiff production schedules and specifications calling for close tolerances. There's nothing like it for getting at burrs in holes, slots, grooves, threads and out-of-the-way-recesses. And because of its flexibility, the operator can do a precision job. Advantages are faster production, less hand work, fewer rejections and lower costs.

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Felt Does It Better
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ESTABLISHED 1824

Along with our steady production of felt wheels we have been making thousands of little felt bobs, such as illustrated. Those using Bacon PARAMOUNT BRAND Bobs have found them of exceptionally good quality, giving full service. We're in position to make any size or shape of any degree of felt hardness desired.

Order PARAMOUNT BRAND Bobs through your regular supplier.

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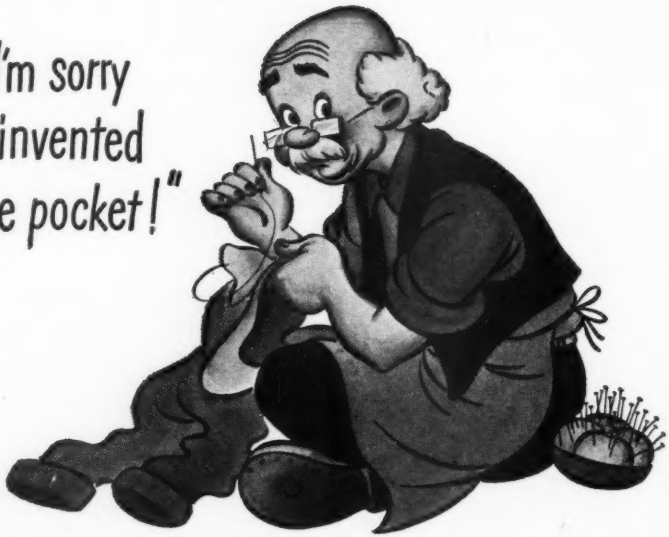
"America's Oldest Felt Manufacturers"

WINCHESTER, MASS. **Established 1824**

~ Felt Does It Better ~

8BF2

"I'm sorry I invented the pocket!"



IF I HAD KNOWN that some Americans would be using pockets to hold all the extra money they're making these days, I never would have invented them.

Pockets are good places to keep hands warm.

Pockets are good places to hold keys . . . and loose change for carfare and newspapers.

But pockets are no place for *any* kind of money except actual expense money these days.

The place—the *only* place—for money above living expenses is in War Bonds.

Bonds buy bullets for soldiers.

Bonds buy security for your old age.

Bonds buy education for your kids.

Bonds buy things you'll need later—that you can't buy now.

Bonds buy peace of mind—knowing that your money is in the fight.

Reach into the pocket I invented. Take out all that extra cash. Invest it in interest-bearing War Bonds.

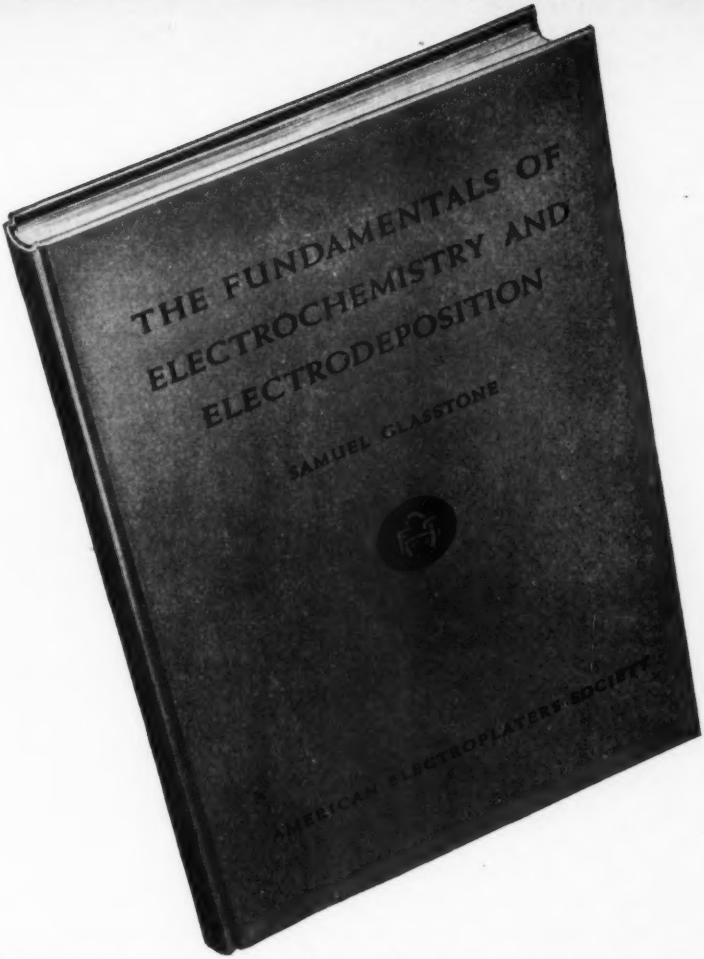
You'll make me very happy if you do.

You'll be happy too.

WAR BONDS to Have and to Hold

The MONTHLY REVIEW

This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council.



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BOOK DEPARTMENT

BOOK REVIEWS

By

DR. GEORGE DUBPERNELL, *United Chromium, Inc.*

Chemistry Made Easy. Cornelia T. Snell and Foster D. Snell. 4 Volumes. 1214 pages. D. Van Nostrand Co., Inc., New York. August 1943. Price $7.95.

This set of books is the only recent up-to-date attempt we know of to write a real self-study course in chemistry. The authors appear to have succeeded quite well. It would appear possible for a person with no training in chemistry to purchase these books and obtain a very considerable knowledge of chemistry without the aid of a teacher or other outside help. This is, no doubt, a difficult task requiring perseverance, energy and ability for success, but these books seem to do almost everything possible to make the task easier. They are quite readable and written in as simple as possible language. Each chapter is followed by problems and questions for self-study and self-examination, and a final examination and answers to the questions are to be found in the back.

The sub-titles of the four volumes are as follows:

I. The Theory of Inorganic Chemistry. 184 pages.
II. Elements and Compounds in Inorganic Chemistry. 232 pages.
III The Aliphatic and Aromatic Compounds of Organic Chemistry. 256 pages.
IV. Chemicals of Commerce. 542 pages.

Platers taking up the study of chemistry with the aid of these books might not wish to go beyond volumes I and II to any great extent, but would find it worthwhile to own the entire set, as each volume is quite thoroughly indexed and therefore of considerable value for reference.

While the books are no doubt on the whole quite dependable, one error was noticed which could be confusing to the electroplater. He should be taught that an ammeter is connected *in* the circuit to measure the current flowing, and a voltmeter *across* part of the circuit to measure the voltage drop. On page 84 of volume I the authors give a diagram of an electrolytic cell with a "voltmeter showing passage of current," and on page 83 the terms voltmeter and ammeter are used interchangeably to describe the same instrument. This would appear to be a serious case of over-simplification, but generally each new term used in the books is defined before proceeding.

The reviewer was quite pleased to see that the authors use only the long-period periodic table of the chemical elements in their teaching. In the reviewer's opinion this is very desirable in connection with

electroplating, as it brings together into a solid group all of the approximately 30 elements which can be plated from aqueous solution, and is much clearer and more worthwhile than the condensed or short-period table almost universally used in teaching chemistry.

Volume IV, "Chemicals of Commerce," is a particularly useful reference book. It not only describes chemicals, drugs, pigments, dyes, etc., but also some more or less proprietary products such as resins or plastics, waxes and oils. Similar types of chemicals or materials are reviewed in separate chapters, but any particular material is readily located by means of an especially complete index.

---

(1) Cleaning and Finishing Metal Products. Published by The Iron Age, New York. 235 pages. $3.00.

(2) An Introduction to Electrochemistry. By Samuel Glasstone. 553 pages. $5.00.

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(4) Standard Handbook for Electrical Engineers. Edited by A. E. Knowlton and R. M. Shook. 2303 pages. $8.00.

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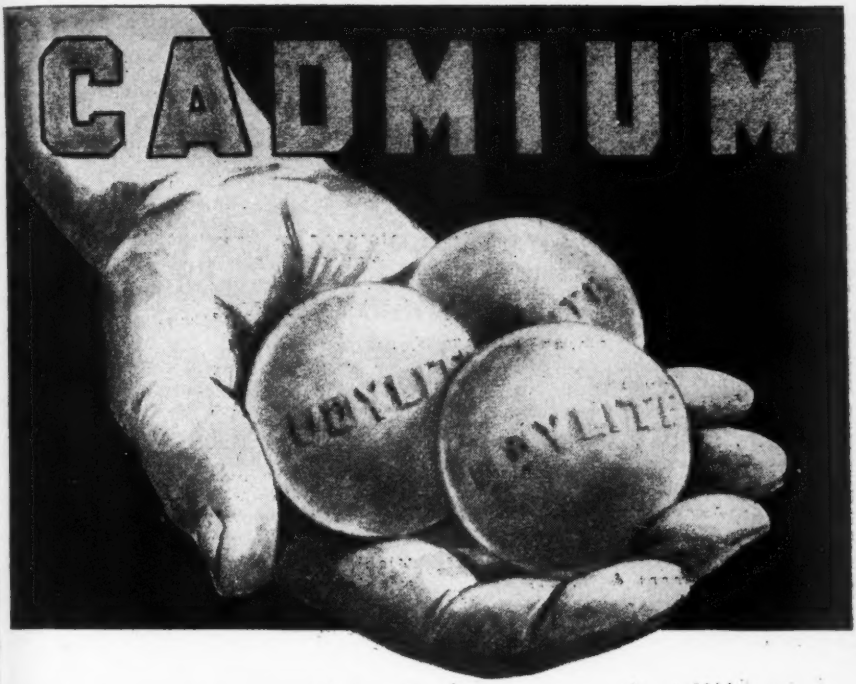

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Chemical Corporation, The 753
Cowles Detergent Co., The .. 755
Crane Equipment & Supply Company 767
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Manderscheid Company, The.. 709
McGean Chemical Company .. 769
Meaker Company, The 703
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Michigan Chrome & Chemical Co. 743
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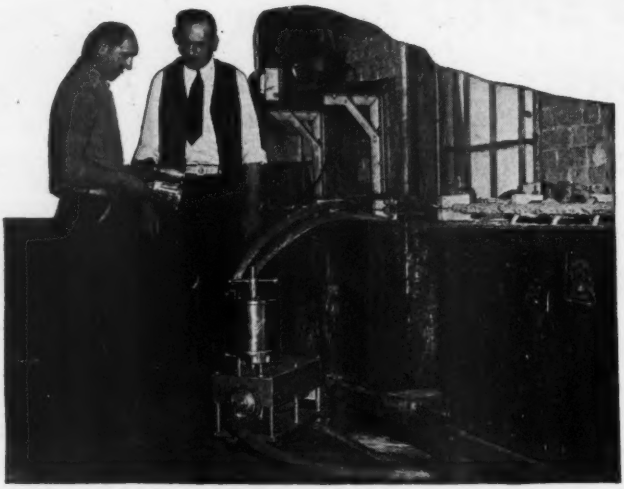

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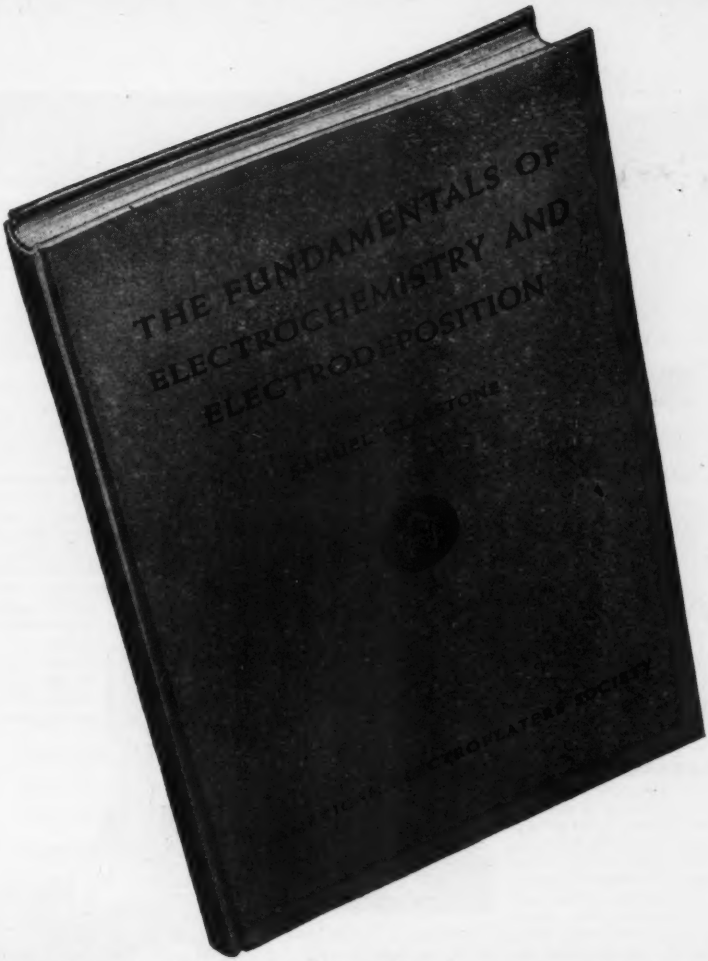

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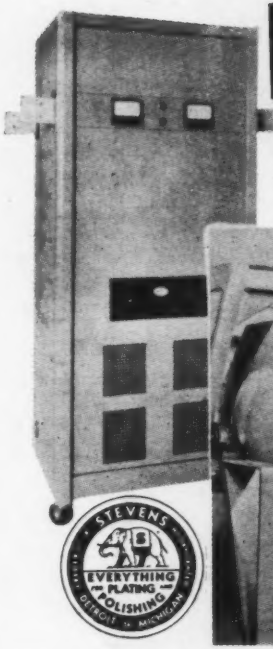

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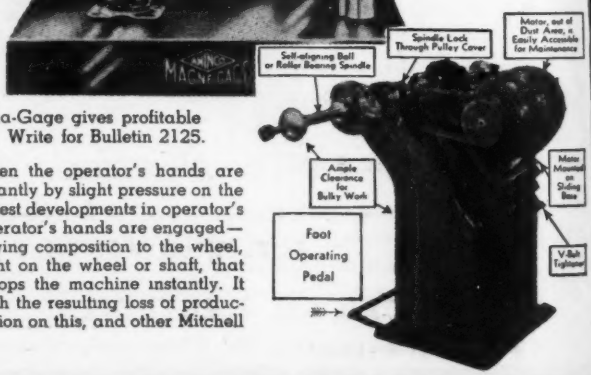
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